Ecological Subsections of Southeast Alaska and Neighboring Areas of Canada

Gregory Nowacki

Michael Shephard

Patricia Krosse

William Pawuk

Gary Fisher

James Baichtal

David Brew

Everett Kissinger

Terry Brock

USDA Forest Service
Alaska Region

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National Park Service Department of the Interior

USGS science for a changing world

British Columbia Ministry of Environment, Lands & Parks

Front cover: A spectacular photo of the normally cloud-shrouded Mount Ada as it towers above the surrounding terrain on the east side of Baranof Island. The peak's angularity provides testament that past continental ice sheets, streaming down Chatham Strait (upper right), did not override its summit.

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Authors

Gregory Nowacki
Patricia Krosse
Gary Fisher
David Brew
Terry Brock
Michael Shephard
William Pawuk
James Baichtal
Everett Kissinger

Contributors

Robert DeVelice
Steven Paustian
Gregory Streveler
William Eichenlaub
Paul Hennon
Dustin Wittwer
Thomas Schumacher
Karen Iwamoto
Michael Brown
William Lorenz
Dennis DeMarchi
Dennis Landwehr
Lewis Sharman
Wayne Howell
Jacqueline de Montigny
Mark Schultz
Rodney Flynn
Frederick Clark
James Llanos
Ken Winterberger
Mason Bryant
Scott Smith

Photographers and on-flight notetakers

Michael Shephard
Rex Friend
William Eichenlaub
Terry Brock
James Baichtal
William Pawuk
Melinda Kuharich
Patricia Krosse
Lewis Sharman
Jake Winn
Gregory Nowacki
Everett Hinkley
Deborah Hinricks

Graphic design & production

Chugach Design Group
Chugach National Forest

David Allen
Winifred Weber
Charles Lindemuth
Gregory Nowacki
Mona Spargo

Background graphics

Katlyn, Kyra, Kimber, and Gregory Nowacki

Editorial reviewers

Winifred Kessler
Julie Benson

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Foreword

I have often heard the phase, "an ecosystem is greater than the sum of its parts," expressing the idea that complex natural systems have characteristics beyond our comprehension. In his 1977 text, ***The Nature of Vegetation: Its Management and Mismanagement***, Dr. Egler stated this view somewhat differently: "ecosystems are not only more complex than we think, they are more complex than we can think." Many people I know would agree with these ideas. I don't.

Here's my idea: "an ecosystem (and its inherent complexity) is exactly equal to the sum of its parts and the relationships among the parts."

Sometimes these relationships are hierarchical: ecosystems "nested" within others and sharing common characteristics across a broad geographic setting. Sometimes these relationships are coincidental: ecosystems defined by unique site conditions such as a geothermal upwelling in an Arctic setting. Sometimes ecosystem relationships are primarily defined by the intentions of their human parts, such as a shopping mall built on a former marsh.

It's up to us "human parts" to make sense of our world and our relationships, to "know" our ecosystems. Interdisciplinary science allows us to describe ecosystem parts and relationships. Geographic Information Systems coupled with statistical models allow us to query, analyze, and display them. Artists render their beauty into breathtaking works. Resource professionals manage them daily using science, expert skill, and intuition. So, many of the pieces are in place for us, together, to "know" this complexity. More pieces are showing up all the time, some technological, some political, and some spiritual.

Ecological Subsections of Southeast Alaska and Neighboring Areas of Canada is a new piece of our mutual "knowing." It is the result of incredible, sometimes painful and often joyful, diligence on the part of its authors. It represents exacting interdisciplinary work, fine uses of technology, and patient communications.

It will be lauded, criticized, and rewritten over time. It will evolve and adapt to new information as more robust classifications or better technologies are developed.

In many ways it is an ethical and spiritual triumph for its authors and for all of us intent on knowing our world. Read it. Understand it. Use it. Respect it.

James A Caplan

Jim Caplan
Deputy Regional Forester for Natural Resources
Alaska Region
November 29, 2000

Abstract

Southeast Alaska is a well-watered, mountain-dominated environment that rims the eastern side of the Gulf of Alaska. A maritime climate, characterized by cool, foggy, and rainy conditions, provides the year-round wetness for vast icefields and temperate rain forests to develop. Unlike most regions where drought and fire are driving ecological forces, here ecosystems are greatly influenced by water and how it is processed over the land. We focused on key factors that control hydrological processes, specifically physiography, *lithology*, and *surficial geology*, to devise a system for distinguishing terrestrial ecosystems. Eighty-five ecological subsections were mapped and described for Southeast Alaska and adjoining areas of Canada. These sizeable units (10-1,000 mi^2) embody similar ecological characteristics (e.g., landforms, streams, vegetation, soils, and wetlands) and provide a practical basis for ecosystem management, planning, and research.

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The biosphere is a complex of interacting *biotic* and *abiotic* components. Understanding how these components operate and interrelate is fundamental to science-based land stewardship. Ecological knowledge increases our capability to appreciate and sustainably manage natural resources through better-informed planning and decision-making. Application of this knowledge requires spatial frameworks to facilitate collection, organization, and interpretation of ecological information.

The lack of such frameworks hampered early land management efforts in the United States. Federal agencies pioneering multiple-use management were stifled by inventories that mapped resources as singular and independent entities rather than in combination (Langston 1995, Bailey 1996). Given this, the inability to adequately assess the effects of human activity on an intricate web of life is understandable. As the twentieth century drew to a close, improved ecological understanding coupled with environmental awareness led to the concept of ecosystem management (Kessler et al. 1992, Christensen et al. 1996). At the core of this management approach is the ecosystem—a term coined in the 1930s to reflect the spatial relations among organisms and their environmental settings (Tansley 1935). To apply principles and practices of ecosystem management, ecosystems must first be delineated and described. This is done through ecological classification and mapping, using visual patterns that indicate organism-environmental interactions. Ecosystems can occur at a variety of scales ranging from a drop of water to the entire universe. Thus, spatial flexibility is highly desirable because it allows mapping at multiple scales to accommodate the needs of land managers and researchers.

Hierarchical frameworks have been devised to group ecosystems into logical associations. The USDA Forest Service, a leader in the development of hierarchical protocols for management application (Bailey 1980, 1995; McNab and Avers 1994; Carpenter et al. 1999), has adopted the "National Hierarchical Framework of Ecological Units" to map and classify terrestrial ecological units (Cleland et al. 1997). This framework stems from Bailey's (1996) concept of the biosphere as a series of interrelated systems within which all components are linked. Changes in one component will often elicit changes in other components and affect the operation of the whole system. By focusing on interrelationships among components, this approach provides a basis for understanding ecosystems and the effects of human use. As with all classification and mapping systems, it greatly simplifies highly complex patterns and phenomena for the benefit of human understanding.

Unavoidably, a certain amount of accuracy must be sacrificed for clarity and generality. For example, *biotic* and *abiotic* factors that occur as continua or gradients across the land (Whittaker 1967) are not easily captured by mapping and classification schemes.

The National Hierarchical Framework of Ecological Units consists of eight nested mapping levels that serve a variety of purposes (Table 1). Within the hierarchy, ecological subsections (hereafter referred to as subsections) characterize mid-sized ecosystems of $10\text{-}10^3$ square miles. Delineation factors for subsections are detailed by Cleland et al. (1997), and include *surficial geology*, *lithology*, *geomorphic process*, soil groups, subregional climate, and *potential natural communities* (or climax vegetation). We selected physiography, *lithology*, and *surficial geology* (factors that determine the land's ability to process water) as the best factors to delineate subsections of Southeast Alaska.[1] A brief ecological overview of Southeast Alaska will provide the background for why these delineation factors were chosen.

Table 1. The National Hierarchical Framework of Ecological Units (after Cleland et al. 1997).

Planning and analysis scale	Purpose, objectives, and general use	Ecological units	General polygon size (mi^2)
Ecoregion	Broad applicability for modeling and sampling.	Domain	10^6
	Strategic planning and assessment.	Division	10^5
	International planning.	Province	10^4
Subregion	Strategic, multiforest, statewide, and	Sections	10^3
	multiagency analysis and assessment.	Subsections	$10\text{-}10^3$
Landscape	Forest or areawide planning, and watershed analysis.	Landtype Association	1-10
Land Unit	Project and management area	Landtype	0.1-1
	planning and analysis.	Landtype Phase	< 0.1

[1]*Southeast Alaska* is capitalized because it is a relatively well-defined region and not meant as a direction.

Ecological Context

Geological and Glacial History

Tectonic movements of the North American and Pacific plates during the past 170 million years have resulted in the *accretion* and uplift of the coastal mountains of Southeast Alaska (Brew et al. 1991). This region is at the receiving end of long-distance transfer of massive crustal blocks across the Pacific Ocean (Conner and O'Haire 1988). Over millions of years, portions of crustal blocks have lodged and welded onto the North American plate, forming southeast-northwest trending rock belts called *terranes* (Figure 1). Fault movements have since offset these *terranes* adding geologic complexity to the region. For instance, up to 90 miles of rock offset has occurred along the Chatham Strait Fault since the docking of *terranes* (Brew 1990).

The close proximity of the St. Elias and Coast Mountains to the North Pacific Ocean has greatly affected the climate and biota of the region through the creation of *orographic* rainfall and rainshadow zones (Graham 1999). These coastal mountains have served as physical barriers to plant and animal dispersal (MacDonald and Cook 1996). Over millions of years, recurrent ice sheets formed and spilled from these mountains onto adjacent surfaces (Pewe 1975). Pushing seaward, these continental ice sheets combined with smaller alpine glaciers descending from *insular* mountains. Together, the ice sheets and glaciers reworked the topography of the land by rounding mountains, scouring bedrock, depositing glacial sediments, and carving U-shaped valleys and submarine trenches (Figure 2). During the last glacial maxima, ice exuded onto the continental shelf from Dixon Entrance, Sumner Strait, Chatham Strait, Cross Sound, and various locations to the north (Heusser 1952, Mann 1986, Barrie and Conway 1999; Figure 3). Opposite to the pattern of advance, the ice sheet retreated first at coastal margins, then receded north and eastwards along major channels and valleys into the mountains. Deglaciation was rapid and largely complete by 14,000 years ago, leaving a barren landscape in its wake (Mann and Hamilton 1995).

The present-day *archipelago*, with its renowned fjords, developed as seawater flooded the deeply incised valleys and trenches left after the last major glacial retreat (Figure 4). Since deglaciation, coastlines have shifted dramatically due to *tectonic* events, worldwide sea level changes, and land rebound associated with glacial unweighting as continental ice sheets retreated (*isostatic rebound*). Elevated fossil-bearing marine beaches and deltas along the coastline clearly indicate an uplift of the land relative to the sea since glacial maxima (Twenhofel 1952).

Post-glacial revegetation of the denuded landscape probably emanated from local *refugia* (ice-free coastal plains and mountain peaks, called *nunataks*) coupled with long-distance migration (Heusser 1955, 1960, 1989; Heaton et

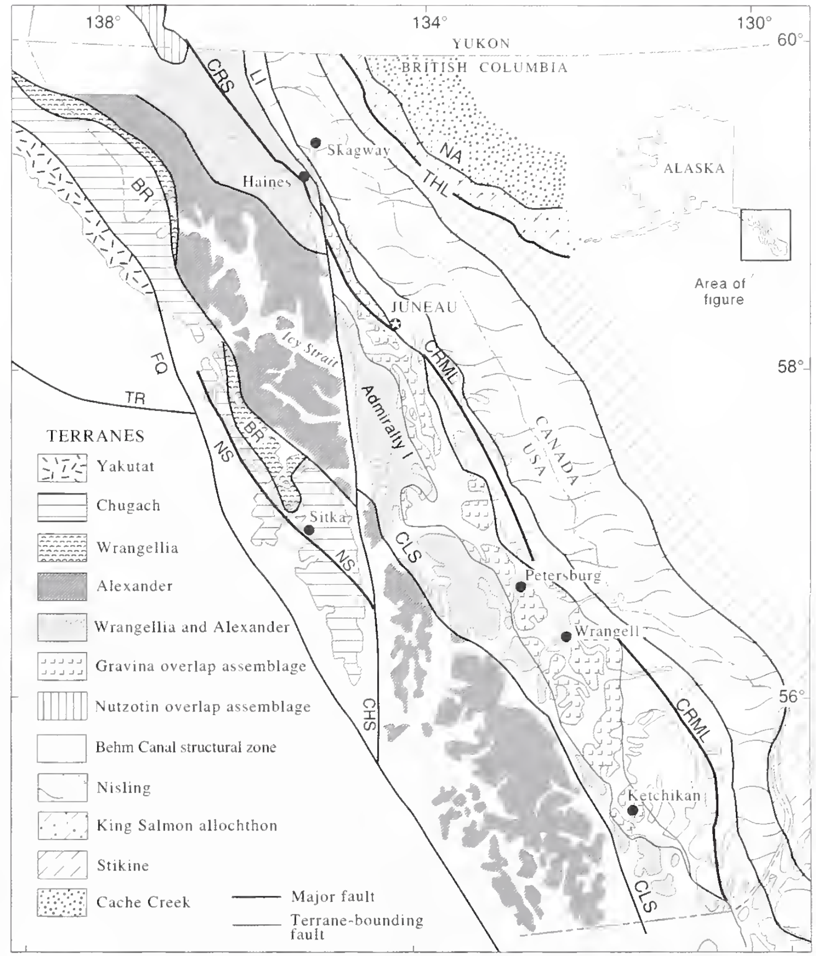


Figure 1. Terranes (accreted rock bodies) and major faults of Southeast Alaska and adjacent areas of Canada (modified from Brew and Ford 1998).

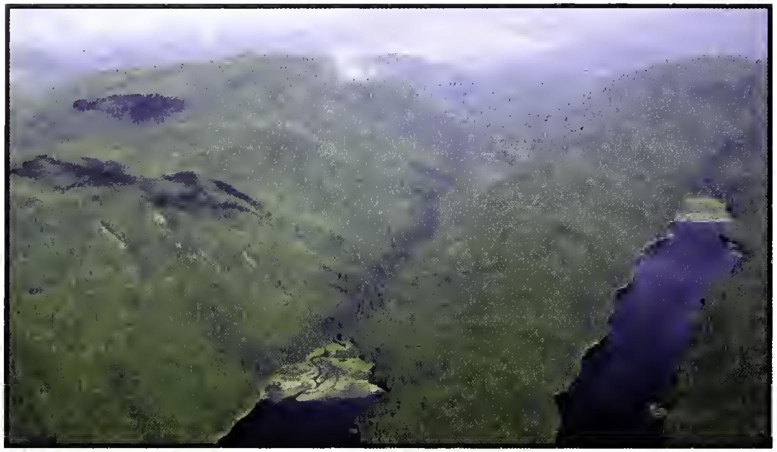


Figure 2. What better example of a glacially modified landscape than this photo? Past ice sheets, streaming down Behm Canal (background), overrode the southern mainland, leaving rounded summits and U-shaped valleys in their wake. Two deeply-etched, paralleling grooves end at Weasel Cove and Badger Bay in the foreground.

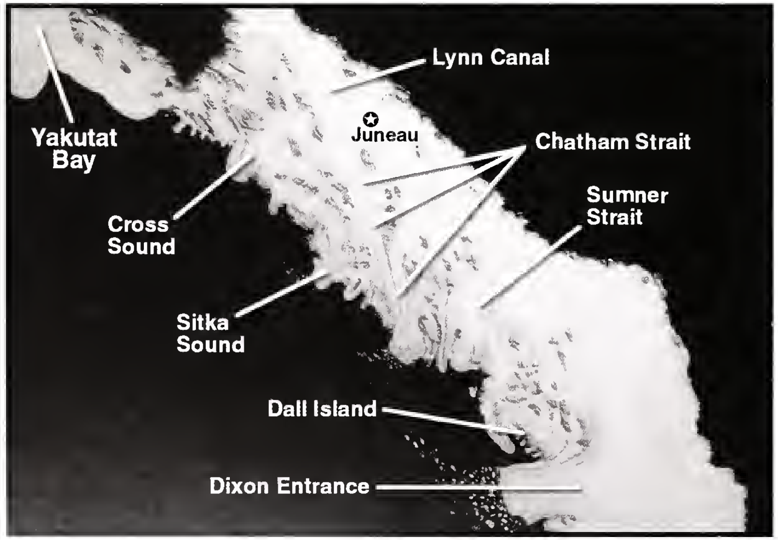


Figure 3. A rough approximation of ice cover over Southeast Alaska during the late Wisconsin glaciation (20,000 B.P.; courtesy Tom Ager, USGS).

al. 1996; MacDonald and Cook 1996). Plant species recolonized independent of one another in accordance with origin (starting location) and rate of dispersal (Pielou 1991). Retreating ice was initially replaced by grasses, sedges, and forbs (herb tundra) followed by dwarf willows and *ericaceous* shrubs (shrub tundra) (Mathewes 1989, Huesser 1989). Trees eventually appeared, in more or less this order: alder, lodgepole pine, Sitka spruce, western hemlock, and mountain hemlock (Heusser 1952, 1955, 1960; Mathewes and Clague 1982; Mann 1983; Mann and Hamilton 1995). This sequence differs somewhat north of Lituya Bay (Peteet 1986). Climatic fluctuations since the last ice age also triggered vegetation changes that continue today (Engstrom et al. 1990, Mann and Hamilton 1995, Pellatt and Mathewes 1997).

The pattern of animal recolonization, like that of plants, was mainly a coast-based expansion. *Paleoendemics* spread from nearby *refugia*, and tundra and woodland mammals immigrated from the north and south, respectively (MacDonald and Cook 1996, Heaton et al. 1996). Interior species arrived relatively late to Southeast Alaska following the opening of river corridors through the coastal mountains. Post-glaciation cycles of ice advance and retreat may have limited the availability and duration of these immigration corridors (Mann 1986). Mammal species richness increases and the degree of *endemism* decreases from the outer coast islands to the mainland (MacDonald and Cook 1996). This pattern is probably indicative of the different colonization abilities of animals following glacial retreat (Conroy et al. 1999). Isolation (distance from the mainland) appears to be a better predictor of species richness than island size, although the latter does have some effect (Conroy et al. 1999).

Fish recolonization emanated from ice-free *refugia* via inland freshwater (through a series of complex drainage changes) and coastal seawater routes (McPhail and Lindsey 1986). Important refuges affecting Southeast Alaska fisheries were the Beringia (central Alaska and Yukon) river systems in the north (Lindsey and McPhail 1986) and Columbia River in the south (McPhail and Lindsey 1986). These fish populations presently overlap at the Stikine River, with greater "Beringian" representation to the north and "Columbian" to the south.

Current Environment

The Pacific Ocean and coastal mountains strongly interact to influence atmospheric circulation patterns, climate, and hydrology in Southeast Alaska (Lawford 1996). The Gulf of Alaska is one of the most meteorologically active places on earth, where a semi-permanent low-pressure system, called the Aleutian Low, issues a near-continuous procession of storms (Wilson and Overland 1986, Salmon 1997). These storms are blocked from inland passage by the coastal mountains ringing the gulf, resulting in heavy precipitation and high-speed winds along the coast (Salmon 1997). Storm frequency peaks during the fall and winter months, with landfall averaging every 4 to 5 days (Wilson and Overland 1986).

Tremendous amounts of heat are ushered into the region by ocean currents. Specifically, the Kuroshio, North Pacific, and Alaska Currents combine to transport tropical-origin waters to Southeast Alaska (Salmon 1997). Seasonal temperature changes expected at these high latitudes (based on changes in solar radiation and day length) are greatly moderated by marine waters. The maze of seawater that permeates the archipelago regulates atmospheric temperatures by providing sea-to-air warming in the winter and sea-to-air cooling in the summer. Atmospheric humidity and cloudiness are bolstered through tremendous inputs of moisture from seawaters. Southeast Alaska receives ample year-round precipitation through the *orographic* lift of moist marine air, with many surfaces routinely averaging more than 100 inches per year! In high mountainous areas, precipitation is often in the form of snow and may be held for long periods in snowfields, icefields, and glaciers. Glacially-bound water is eventually released in mass quantities in the summer, causing mountain streams to swell.

At lower elevations, precipitation falls as rain and snow. Water readily drains through the soil on steep slopes, allowing conifer forests to dominate. Productive forests thrive on wind-exposed sites, where water readily percolates through soils churned by recurrent root throw. On flat and gently rolling *terrain* at the base of steep slopes, water often accumulates to form vast networks of forested and nonforested bogs and fens (Zach 1950, Neiland 1971, Dachnowski-Stokes 1941). Here and on certain wind-protected (unchurned) sites, paludification (waterlogging), *Sphagnum* invasion, and peat formation are likely outcomes (Bormann et al. 1995, Stevens 1965). Peatland development is also fostered by the cool year-round temperatures of the region, which greatly suppress decomposition rates.

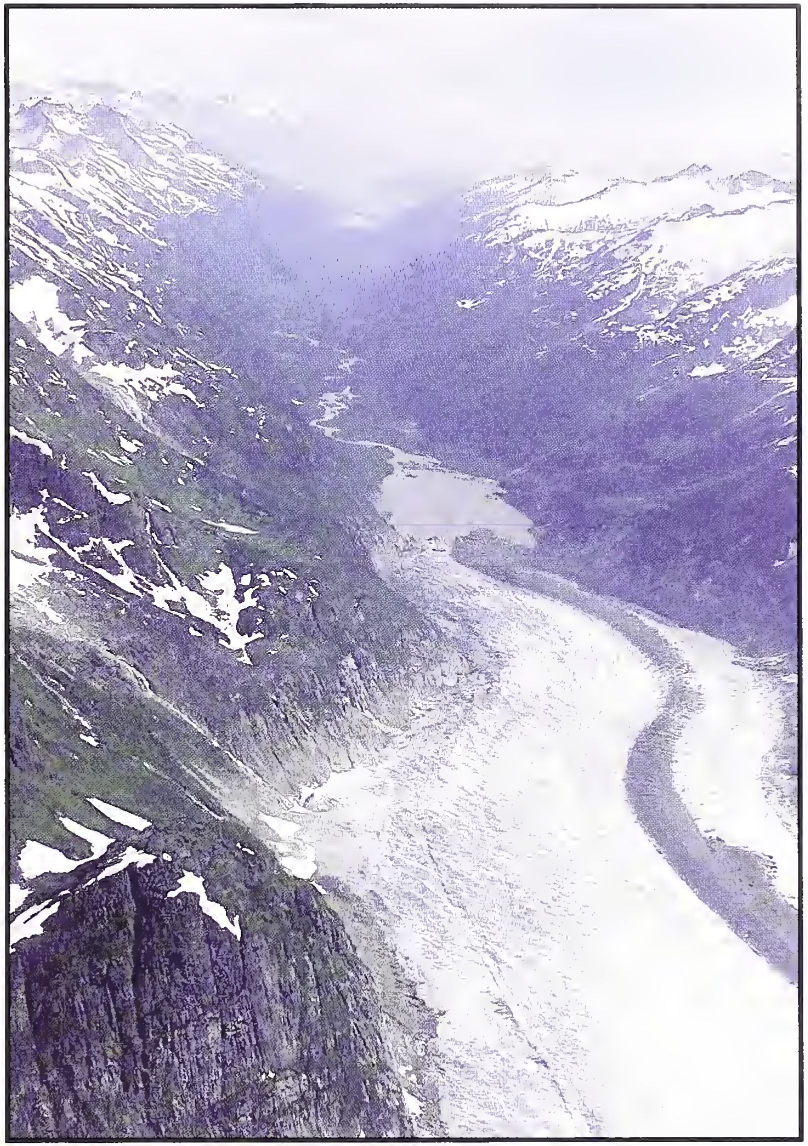


Figure 4. After glaciers retreat from rugged terrain, scoured valleys are partially inundated by seawater to form fjords. The scene looks southeastward from the Ferebee Glacier towards Lynn Canal.

There is ongoing debate as to the ecological endpoint of these low-elevation landscapes. Zach (1950) and Ugolini and Mann (1979) argue that muskeg (peatlands) is the climax condition, whereas Stephens et al. (1970) surmise that muskegs are diminishing because of the presence of non-woody peat layers in forested soils. Both opinions have merit, indicating that these are complex landscapes with various processes controlling ecological pathways and succession. At the site level, it appears that ecosystem productivity is governed by soil age and microrelief, with root-churned soils being more productive than non-churned soils (Bowers 1987).

The terrestrial ecology of Southeast Alaska is intimately linked to how water is processed throughout the landscape. The moist maritime climate nurtures lush conifer rain forests, wetland complexes, and vast icefields throughout the rugged *terrain*. Cool summers, lack of summertime droughts, and transient sea level snow in the winter are distinguishing characteristics of this temperate rain forest zone (Alaback 1996). The existence of temperate rain forests at these relatively high latitudes is unique and of global significance (Kellogg 1995, Alaback 1996). Biological productivity is normally limited by the lack of water (Kramer and Kozlowski 1979, Barbour et al. 1980), yet the opposite is true in Southeast Alaska. Wet year-round weather (persistent rains, overcast and fog, high humidity, and low *evapotranspiration* rates) greatly curtails drought and fire, which are prominent disturbance forces in most other ecosystems (cf. Wright and Bailey 1982, Pyne 1982, Agee 1993). Instead, wind disturbance associated with North Pacific storms largely drives forest dynamics along the West Coast (Harris 1989, Redmond and Taylor 1997, Nowacki and Kramer 1998). Wind disturbance regimes (exposure to or protection from catastrophic winds) greatly influence landscape patterns of forest structure, stand ages, and levels of live tree decay (heart rot) (Farr et. al 1976; Kramer 1997; P. Hennon, pers. comm.).

Distinct gradients in temperature (south to north) and precipitation (east to west) occur across Southeast Alaska (Figure 5). These climatic gradients are reflected in patterns of plant distribution. The northern extent of western redcedar, Pacific silver fir, salal, steeplebush, and sword fern correlate with mean winter temperatures across the archipelago. A “drier” zone, extending through the center of the archipelago in the lees of the Fairweather Range and the mountains of Chichagof and Baranof Islands, corresponds with the distribution of certain vascular and moss taxa (Worley 1972). A set of broad vegetation zones corresponds with altitude, grading from western hemlock and Sitka spruce dominance at low elevations, mountain hemlock forests at mid elevations, and subalpine and alpine meadows, barrens, and icefields at high elevations. The forested zones become increasingly compressed and restricted to lower elevations with northward progression along the coast.

Regional climatic gradients appear to influence several important tree mortality processes as well. The parasitic plant, hemlock dwarf mistletoe, occurs no further north than the shores of Lynn Canal and Glacier Bay (Hawksworth and Wiens 1996). Shorter growing seasons may prevent mistletoe from completing its life cycle, thus limiting its range in these areas. The same phenomenon may restrict mistletoe to lower elevations within its natural range. The distribution of the intensive yellow-cedar dieback occurs on the coast (warm) side of estimated average winter isotherms (Figure 5). The onset of intensive mortality, about 1880 to 1900, coincides with a period of climatic warming in coastal Alaska (Hennon and Shaw 1994), although the actual cause of tree death is still not fully understood (Hennon and Shaw 1997). Annual precipitation seems to be a useful predictor of the distribution and outbreak occurrence of spruce beetle (drier zones) and hemlock sawfly (wetter zones) in Southeast Alaska (USDA Forest Service 2000).

A dense network of short, swift streams drains the steep, highly fragmented, coastal landscape. The rugged *terrain* and its inherent physical instabilities (e.g., landslides, avalanches, and debris flows on steep, glacier-carved slopes) greatly affect stream morphology and dynamics. Southeast Alaska has the highest mean annual runoff along the West Coast, although water discharge fluctuates dramatically from high flows in summer and fall to low flows in winter (see Fig. 6.3 of Naiman and Anderson 1997). A high rate of surface weathering (especially *base cations*) typical of a rain-soaked, deglaciated landscape is evident in stream water chemistry (Hedin and Hetherington 1996). From spring to fall, most rivers and streams of Southeast Alaska teem with *anadromous* fishes, including coho, chum, pink, sockeye, and Chinook salmon, steelhead, cuttroat trout, Dolly Varden, and eulachon. With their prolific spawning runs, salmon are considered keystone species and major suppliers of nutrients to aquatic and terrestrial systems (Willson and Halupka 1995). Indeed, through its intricate network and abundance of life, the sea is indisputably linked with the terrestrial ecology of Southeast Alaska (Sydeman and Lund 1996).

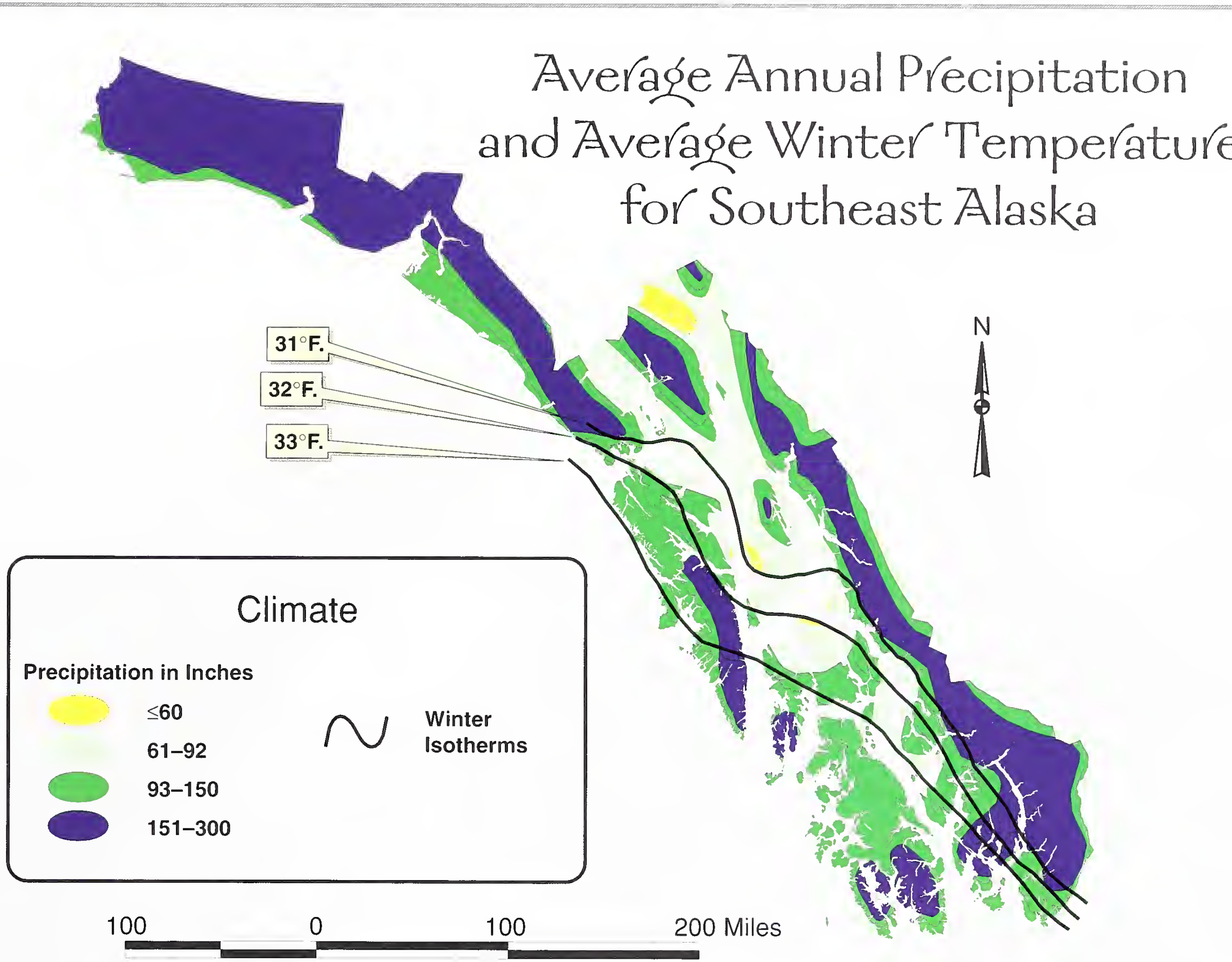


Figure 5. Mean annual precipitation zones and winter isotherms for Southeast Alaska. (Illustration modified from USDA Forest Service 2000; precipitation information from Schwartz and Miller 1983.)

The Human Factor

We know through oral histories and archaeological evidence that Natives have a long history in Southeast Alaska and deep-rooted ties to the land. A radiocarbon date from Groundhog Bay on the Chilkat Peninsula confirms human presence for 10,180 ± 800 years B.P. (Ackerman 1968). Other prehistoric sites on Prince of Wales (Fifield 1996, Parfit 2000) and Baranof Island (Davis 1984) have returned similar dates. Bone tests reveal seafood as a major component of early human diets (Parfit 2000). Much of the archeological evidence of these early coastal peoples lie submerged due to sea-level changes and land subsidence. Our knowledge of early human cultures, including the peopling of the Americas, will increase greatly once researchers access the wealth of archeological information currently resting on the sea floor (Parfit 2000).

Early European explorers found the land occupied by Tlingit and Haida Indians. These maritime peoples occupied areas near the coast and along larger rivers where a bountiful variety of food resources was readily available (Emmons 1991). Fish (particularly salmon) and berries were their staple foods, supplemented by shellfish, sea and land mammals, seaweed, waterfowl, and bird eggs (Niblack 1890). Natives moved seasonally in accordance with weather conditions and the availability of key resources (Goldschmidt and Haas 1998). From spring to early fall, the Tlingit and Haida dispersed to remote camps along coastal waters and larger salmon-bearing rivers. During late fall and winter, they pooled their resources and congregated at villages in protected places. Numerous plant species were harvested to sustain Native peoples (see Table 1 of Turner et al. 2000). Land alterations were mainly limited to clearing for villages and gardens and tree harvesting for fuel, buildings, canoes, tools, cordage, food, and fiber-weaved clothing. Native burning, whether by accident (unextinguished campfires or untended signal fires) or intent (i.e., for land clearing, fuelwood preparation, and berry patch maintenance), was limited by the wet conditions of Southeast Alaska. The documented use of fire in coastal cultures to the south (Boyd 1999, Turner 1999) probably did not occur here at the same frequency because precipitation increases northward (both in terms of equability and accumulation) along the West Coast (Alaback 1996, Redmond and Taylor 1997).

The traditional subsistence lifestyle of Natives was profoundly affected when western cultures ushered in extractive-based industries in the mid-1700s (Rakestraw 1994). Russian and British fur traders, in pursuit of otter, seal, and beaver pelts, were followed later by American enterprises in trapping, fishing, mining, logging, homesteading, and fox farming. In spite of the changes brought by Euro-Americans, subsistence is still important, especially in rural areas of Southeast Alaska.

Timber harvesting has had a substantial impact on the region's vegetation. Early timber removal was labor-intensive and difficult, entailing the selective harvest of accessible beachfront trees by hand (Rakestraw 1994). Russians extensively logged the shores of Sitka Sound and Peril Strait, actually depleting local stocks of Alaska yellow-cedar (Bancroft 1886). Most beachfront forests where selectively logged at least once by the time cable logging replaced hand logging in the 1920s (Rakestraw 1994). Sitka spruce was targeted and selectively logged during World Wars I and II for airplane construction. A dramatic shift from small-scale, coastal, selective harvests to large-scale, inland, clearcut logging accompanied the establishment of a local pulp industry in the 1950s. Today, extensive patches of second growth forests occur in some portions of Southeast Alaska following 50 years of industrial timber harvest.

Ecological Subsection Delineation Criteria and Mapping

Along the rain-soaked West Coast, most ecosystem patterns and processes are ultimately traced to the land's ability to shed and process water. Given the importance of hydrologic processes, we chose physiography, *lithology*, and *surficial geology* as the principal delineation criteria for defining subsections. The use of these delineators has precedence in temperate rain forest systems. Montgomery (1997) found topo-geologic factors as important determinants of coarse-scale ecological patterns and processes and proposed their use for defining West Coast ecosystems. These physical factors embody the complex interplay of *tectonic*, *geomorphologic*, and hydrologic processes which, in turn, govern the distribution of habitat types and natural disturbances in these landscapes (Montgomery 1997). These factors explain much of the coarse-scale variation we see in vegetation (composition, structure, and productivity), soils (genesis, morphology, carbon and nutrient cycling), hydrology (stream channel types, groundwater levels, sedimentation rates, nutrient levels, lake and wetland distribution), fish and wildlife habitat and productivity, glacial history and erosional processes (landform features, surficial deposits), and natural disturbance regimes (type, frequency, intensity).

The region's physiography represents a topographically complex *terrain* exposed to repeated glacial activity. Broad physiographic areas were delineated, including icefields, recently deglaciated areas, large mainland river systems, angular mountains, rounded mountains, hills, lowlands, and recent volcanic fields. These distinct physiographies reflect the *geomorphic* and glacial history of the land—how continental icesheets flowed, scoured, and deposited materials over the land, superimposed on changes wrought by *tectonics* and volcanism.

Lithology and surficial deposits have profound effects on terrestrial and aquatic patterns and productivity in Southeast Alaska. Appreciable differences in water chemistry are associated with the type of bedrock from which they originate or contact (Wissmar et al. 1997). Substrate influences soil productivity to a lesser degree, with basalt and limestone having the most pronounced effects on soil chemistry (Heilman and Gass 1974). Seven generalized *lithologies* were delineated, including granitics, noncarbonate sedimentary, carbonate sedimentary, metasedimentary, complex sedimentary and volcanics, volcanics, and *mafics*/ultramafics. United States Geological Survey and U.S. Forest Service geologic maps were the sources of bedrock information (see Appendix A). We deferred to the 1:600,000 scale geology map of Gehrels and Berg (1992) where finer-scale information was not available. Many *lithologic* bodies (*plutons*, ultramafic intrusions) too small to distinguish at the subsection scale were grouped into larger adjacent rock bodies. Where surficial deposits of unconsolidated sediments effectively masked the underlying bedrock within lowlands, the type of deposition was identified as glacial *till* (ice-contact deposits), glacial outwash (*glaciofluvial* deposits), or glacial marine sediments (*glaciomarine* deposits).

Applying these topo-geologic criteria, we delineated more than 160 polygons on 1:250,000 topographic maps. Collaborations with Dennis DeMarchi (British Columbia Ministry of Environment, Lands, and Parks) and Scott Smith (Agriculture and Agri-Food Canada, Research Branch) allowed delineation of polygons that extend into Canada. Each polygon was given a unique label and digitized in the Geographic Information System (GIS). Next, polygons possessing similar ecological characteristics were merged to form subsections. This process was aided by cluster analysis, a statistical procedure that groups or "clusters" items together based on their ecological similarity. For our exercise, polygons were populated with environmental data from the following GIS layers (note: these data were available only for lands within Tongass National Forest boundaries):

1. land cover type (alder, cedar, hemlock, poplar, hemlock-spruce, spruce, brush, freshwater, landslides, muskegs, alpine, ice-snow, or rock);
2. soil wetness (hydric or nonhydric);
3. forest site index (0-40, 41-60, 61-80, or >80); and
4. *stream process groups* (*alluvial fan*, *estuarine*, *flood plain*, *glacial outwash*, *high gradient-contained*, *lake*, *palustrine*, *moderate gradient-contained*, *moderate gradient-mixed control*, or *low gradient-contained*).

These data layers were selected because of their GIS coverage (spanning the entire 17-million-acre Tongass National Forest) and relative independence from the delineation criteria. These environmental data were converted to percentages and subjected to cluster analysis (unweighted pair-grouping method). Using the analysis results and our group's collective knowledge of climate, geomorphology, glacial history, soils, hydrology, and vegetation, we defined 85 subsections for Southeast Alaska and adjoining parts of Canada. Subsection names are concatenations of prominent local geographic features and the primary lithology (or the most ecologically significant bedrock type as in the case for carbonates) or surficial deposits occurring within each.

Hierarchical Arrangement and Final Correlation

A hierarchical classification for subsections was created to reflect developmental histories of terrestrial surfaces of Southeast Alaska (Table 2). Three *terrain* classes were distinguished at the first level. Subsections currently affected by glacial processes (ice accumulation and movement, meltwater streams with heavy *bedloads*, deglaciated areas of primary succession) were classified as active glacial terrains. Older surfaces developing after the retreat of continental ice (≥14,000 years ago) fell into the inactive glacial terrain class. The majority of subsections occurred in this category. Subsections resulting from post-glacial processes not related to glaciation (i.e., volcanism) were classified as post-glacial terrains. These three classes were then divided by physiography. This second level was further subdivided by *lithology* and *surficial geology* (referred to as geologic classes) to form a third hierarchical tier.

Table 2. A hierarchical arrangement of subsections of Southeast Alaska and adjoining portions of Canada based on geomorphic and glacial origin, topography, lithology, and surficial deposits. The first, second, and third levels represent terrain classes (Roman numerals), physiographic classes (capital letters), and geologic classes (numbers), respectively.

- I. Active Glacial Terrains
    - A. Icefields
    - B. Recently Deglaciated Areas
        - 1. Exposed Bedrock
        - 2. Unconsolidated Sediments
    - C. Mainland Rivers
        - 1. Valleys
        - 2. Deltas
- II. Inactive Glacial Terrains
    - A. Angular Mountains
        - 1. Granitics
        - 2. Sedimentary, Noncarbonates
        - 3. Sedimentary, Carbonates
        - 4. Metasedimentary
        - 5. Complex Sedimentary & Volcanics
        - 6. Mafics/Ultramafics
    - B. Rounded Mountains
        - 1. Granitics
        - 2. Sedimentary, Carbonates
        - 3. Metasedimentary
        - 4. Complex Sedimentary & Volcanics
        - 5. Volcanics
    - C. Hills
        - 1. Granitics
        - 2. Sedimentary, Noncarbonates
        - 3. Complex Sedimentary & Volcanics
        - 4. Volcanics
    - D. Lowlands
        - 1. Till Lowlands
        - 2. Outwash Plains
        - 3. Glaciomarine Terraces
        - 4. Wave-cut Terraces
- III. Post-glacial Terrains
    - A. Volcanics

Data Analyses for Ecological Subsection Descriptions

To help validate and describe ecological subsections, we conducted data queries of GIS layers using a 20-acre offset grid covering all lands within the boundaries of the Tongass National Forest (Figure 6). The grid was constructed for the Tongass Land Management Plan Revision as an efficient way of compiling information over a vast area (~17 million acres). Spatial information from pertinent resource layers were transferred into the grid by populating each 20-acre cell with data at its center point. Each point is of the same approximate distance (1,000 feet) to its six neighboring points.

The grid, in turn, was used to populate the subsection layer with environmental data. Subsections that extended outside National Forest System boundaries were incompletely populated with data (e.g., Boundary Ranges Icefields). As such, summary data was presented only for those subsections that had >15% of their area covered by the grid (Table 3). The specific data layers and queries used to produce summary tables for individual subsections are described in Appendix B.

Figure 6. Areas of Southeast Alaska covered by the 20-acre offset grid. The grid area corresponds to the boundaries of the Tongass National Forest.

Data Analyses for Ecological Subsection Descriptions

Table 3. Total area (acres) and percentage of grid coverage of ecological subsections delineated for Southeast Alaska and adjacent areas of Canada. Subsections are listed alphabetically by name.

Ecological Subsection	Total Area (Acres)	Grid Coverage (%)
Affleck Canal Till Lowlands	55,324	100
Alsek-Tatshenshini River Valleys	188,921	0
Alvin Bay Sediments	81,061	100
Behm Canal Complex	234,391	100
Bell Island Granitics	330,515	100
Berg Bay Complex	95,976	7
Berg-Beardslee Moraine	50,100	0
Boca De Quadra Complex	127,847	100
Boundary Ranges Icefields	9,070,362	46
Cape Fanshaw Complex	67,955	100
Cape Spencer Complex	63,559	0
Central Baranof Metasediments	358,086	100
Central POW Till Lowlands	243,708	100
Central POW Volcanics	496,702	100
Chilkat Complex	632,870	2
Chilkat Peninsula Carbonates	539,319	63
Chilkat River Valley	58,207	0
Clarence Strait Volcanics	256,733	100
Dall-Outside Complex	287,473	100
Duke Island Till Lowlands	63,849	100
Duncan Canal Till Lowlands	243,942	100
Dundas Bay Granitics	49,942	0
Dundas River Flats	25,072	0
Eastern Passage Complex	243,665	100
Elevenmile Till Lowlands	47,869	100
Etolin Granitics	88,711	100
Fairweather Front Range Complex	87,593	0
Foggy Bay Till Lowlands	55,937	100
Freshwater Bay Carbonates	261,116	100
Gulf of Esquibel Till Lowlands	45,304	100
Gustavus Flats	35,110	0
Hetta Inlet Metasediments	227,055	100
Holkham Bay Complex	509,435	100
Hood-Gambier Bay Carbonates	218,972	100
Hugh Miller-Geikie Inlet Mountains	81,266	0
Kake Volcanics	133,466	100
Kasaan Peninsula Volcanics	35,641	100
Ketchikan Mafics/Ultramafics	68,967	100
Klawock Inlet Till Lowlands	15,000	100
Kook Lake Carbonates	102,066	100
Kuiu-POW Granitics	147,368	100
Misty Fiords Granitics	2,152,177	69
Mitchell-Hasselborg Till Lowlands	93,338	100

Ecological Subsection	Total Area (Acres)	Grid Coverage (%)
Moira Sound Complex	121,539	100
Mount Edgecumbe Volcanics	72,990	100
Necker Bay Granitics	185,045	100
North Admiralty Complex	313,244	100
North Baranof Complex	128,460	100
North Chichagof Granitics	401,498	100
North POW-Kuiu Carbonates	251,274	100
North POW Complex	80,970	100
Outer Coast Wave-cut Terraces	115,419	100
Outer Islands Complex	32,767	93
Peril Strait Granitics	232,747	100
Point Adolphus Carbonates	117,321	100
Princess Bay Volcanics	55,561	100
Puget Peninsula Metasediments	99,964	100
Queen-Tidal Inlet Mountains	111,076	0
Rowan Sediments	130,323	100
Salmon River Sediments	21,350	0
Sitka Sound Complex	185,823	100
Skowl Arm Till Lowlands	87,950	100
Soda Bay Till Lowlands	148,401	100
South Admiralty Volcanics	187,382	100
South Baranof Sediments	168,827	100
South POW Granitics	138,783	100
St. Elias-Fairweather Icefields	12,243,652	7
Stephens Passage Glaciomarine Terraces	283,000	100
Stephens Passage Volcanics	94,785	100
Stikine River Delta	42,165	100
Stikine Strait Complex	63,932	100
Stikine-Taku River Valleys	530,726	17
Sumner Strait Volcanics	359,012	100
Thayer Lake Granitics	71,811	100
Thomas Bay Outwash Plains	30,744	100
Thorne Arm Granitics	63,077	100
Traitors Cove Metasediments	320,854	100
Upper West Arm Mountains	25,778	0
Ushk-Patterson Bay Granitics	114,864	100
Vixen Inlet Till Lowlands	27,481	100
Wachusett-Adams Hills	142,973	3
West Chichagof Complex	133,263	100
Wrangell Narrows Metasediments	313,238	100
Yakutat-Lituya Forelands	1,177,890	32
Zimovia Strait Complex	221,526	100
Total	37,921,455	

Use of Ecological Subsections

Terrestrial ecosystems can be defined at various spatial scales and arranged in a nested, hierarchical framework. This framework helps people understand how ecosystems operate through the interaction of environmental factors, thus providing an ecological template for science-based resource management. Being hierarchical, the framework provides land managers with the flexibility to select the appropriate scale(s) to effectively evaluate resource issues, design plans, compare management actions, assess environmental effects, and execute fieldwork. Likewise, it provides researchers a spatial template to couch research questions, design and conduct experiments, and reasonably extrapolate results all within an ecological context.

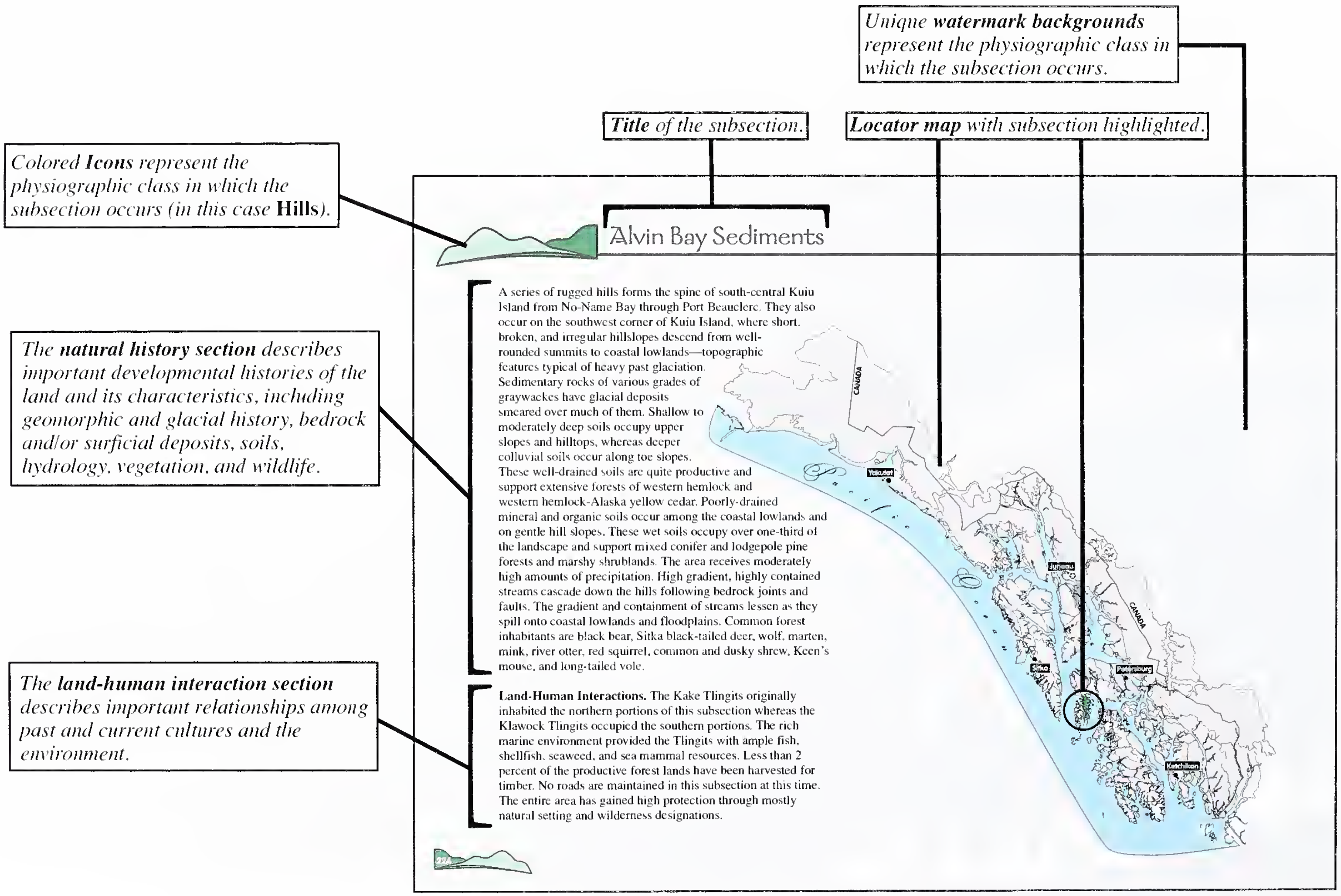
Hierarchical frameworks allow individual components of the environment to be analyzed and understood within a larger ecological context. For instance, the spatial variation and dynamics of vegetation, soils, and wildlife can be evaluated in relation to larger landscape patterns and processes. Ecological subsections are already being integrated into various resource projects in Alaska. They served as the basis for the development of 5th order hydrologic units for the Tongass National Forest. Also, they formed the foundation for the Montreal Process Criteria and Indicator pilot test on the Tongass National Forest. Much potential exists for near-term use of ecological subsections. For instance, refinement of forest health surveys in Southeast Alaska can be achieved by replacing broad-scale ecoregion units with subsections (USDA Forest Service 2000). Researchers can benefit by using subsections to stratify and describe study areas in a landscape context. Physiographic classes (hierarchical level II) can provide landscape architects with an ecological basis to designate and describe viewsheds.

Ecological subsections represent mid-sized terrestrial ecosystems (10-1,000 mi^2). Their hierarchical arrangement can be thought of as an ecological "address system" akin to the Zip Code, with each level reflected in the final map code. These units provide an ecological basis and address system with many potential applications:

1. Assist in the development of future land management plans and NEPA projects based on land capability and suitability.
2. Assess effects of human activities (silvicultural treatments, road systems, recreation, etc.) on the environment (productivity, water quality, habitat fragmentation) at a landscape scale.
3. Determine adequate representation of natural or reserve areas (old-growth reserves, research natural areas, special interest areas) within managed landscapes (see Snyder et al. 1999).
4. Aid in the ecological design and description for landscape analyses (Diaz and Apostol 1992), watershed assessments (USDA Forest Service 1995, McCammon et al. 1998), riparian zone management (Naiman et al. 2000), and other projects.
5. Assign reasonable spatial limits for collecting data and extrapolating findings for landscape-level research and monitoring.
6. Describe baseline environmental characteristics (e.g., natural forest fragmentation) to assess natural and land-use changes.
7. Aid future endeavors in wildlife modeling (e.g., species distributions and patterns) by delimiting landscapes having similar vegetation (or habitat) patterns and productivity.
8. Explain landscape concepts and ecological characteristics of Southeast Alaska to partner organizations, high school and college students, and tour groups.
9. Understand and model the spatial distribution of natural disturbances (i.e., wind, landslides, avalanches, floods, insects, and disease) across Southeast Alaska (see Kramer 1997).
10. Serve as a coarse filter for assessing biological diversity (Haufler et al. 1996).
11. And, delineate viewsheds for Seen Area Mapping and Visual Analysis.

The Intent of this booklet

This booklet was written to convey information to diverse users including land managers and planners, resource specialists, field technicians, researchers, educators, and people interested in landscape ecology. We have attempted to simplify complex ecological relationships and processes for general understanding by a wide audience. Those requiring more detailed, resource-specific information can refer to the data tables and charts accompanying most subsection descriptions. Although we tried to minimize its use, technical terminology could not be entirely avoided. To

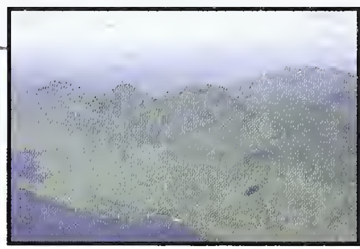


aid the reader, technical terms have been italicized in the document and defined in the glossary. Also, common species names have been used in the document. Scientific names can be found in the Species Reference List at back. A large fold-out map is located in the envelope at back.

*Representative **landscape photo** with descriptive caption.*

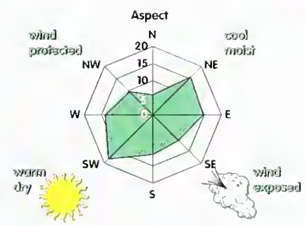
***Table** showing nine resource themes in ranked order (top five classes) based on Geographic Information System data layers and queries.*

***Colored swatch pattern** corresponding to subsection location on large fold-out map.*

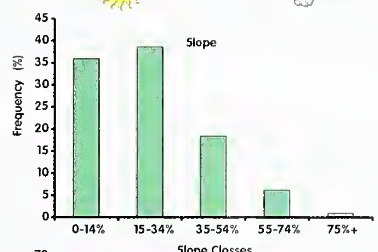


A view from over the north end of Affleck Canal near Bear Harbor looking to the northeast towards Port Beauclerc. The landscape is characterized by hills and low, rounded mountains that are often separated by lowlands and valley bottoms.

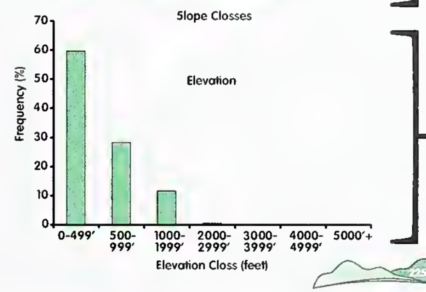
Alvin Bay Sediments	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (46%)	Lowlands (39%)	Hills (10%)	Valley Floor (5%)	Mountain Summits (1%)	97
Parent Materials	Colluvium (38%)	Ablation Till (26%)	Residuum (24%)	Glacial Drift (6%)	Compact Till (5%)	73
Soils	Spodosols (63%)	Histosols (35%)	Entisols (1%)	Inceptisols (1%)		97
Landcover	Hemlock (50%)	Hemlock-Spruce (22%)	Alder (9%)	Mixed Conifer (8%)	Lodgepole Pine (7%)	100
Productivity	Productive Forests (72%)	Nonproductive Forests (26%)	Nonforested (2%)			100
Site Index	SI 61-80 (36%)	SI 0-40 (30%)	SI 41-60 (20%)	SI >80 (14%)		100
Wetlands	Upland (58%)	Palustrine Forested (32%)	Palustrine Emergent (6%)	Palustrine Scrub-Shrub (1%)	Estuarine Intertidal (1%)	100
Stream Process Groups	High Gradient-Contained (60%)	Moderate Gradient-Mixed Control (16%)	Moderate Gradient-Contained (7%)	Floodplain (7%)	Palustrine (4%)	
Land Use Designations	Wilderness & Monument (53%)	Mostly Natural Setting (47%)				100



*Radar graph showing the percentage of area within the eight cardinal directions of **aspect**. Two major environmental gradients are depicted: a regional wind gradient (southeast to northwest) and temperature/moisture gradient (southwest to northeast).*



*Frequency histogram representing five **slope** categories.*



*Frequency histogram representing seven **elevation** categories.*

Ecological Descriptions

The hierarchical organization of ecological subsections is depicted below. Written descriptions accompany each hierachical category (terrain, physiographic, and geologic classes) and subsection. Physiographic classes (hierarchical level II) are uniquely identified by color: icefields (purple), recently deglaciated areas (blue), mainland rivers (pink), angular mountains (brown), rounded mountains (orange), hills (green), lowlands (yellow), and volcanics (red).

Each subsection description contains sections on natural history and land-human interactions. The natural history section highlights the prevailing

SOUTHEAST ALASKA ECOLOGICAL SUBSECTION HIERARCHY

ACTIVE GLACIAL TERRAINS

- **ICEFIELDS**
  - Boundary Ranges Icefields
  - St. Elias–Fairweather Icefields
- **RECENTLY DEGLACIATED AREAS**
  - Exposed Bedrock
    - Hugh Miller–Geikie Inlet Mountains
    - Queen–Tidal Inlet Mountains
    - Upper West Arm Mountains
  - Unconsolidated Sediments
    - Berg–Beardslee Moraine
    - Dundas River Flats
    - Gustavus Flats
    - Wachusett–Adams Hills
    - Yakutat–Lituya Forelands
- **MAINLAND RIVERS**
  - Valleys
    - Alsek–Tatshenshini River Valleys
    - Chilkat River Valley
    - Stikine–Taku River Valleys
  - Deltas
    - Stikine River Delta

- **ANGULAR MOUNTAINS**
  - Granitics
    - Dundas Bay Granitics
    - Necker Bay Granitics
  - Sedimentary, Noncarbonates
    - South Baranof Sediments
  - Sedimentary, Carbonates
    - Chilkat Peninsula Carbonates
  - Metasedimentary
    - Central Baranof Metasediments
    - Puget Peninsula Metasediments
  - Complex Sedimentary & Volcanics
    - Cape Spencer Complex
    - Dall–Outside Complex
    - Fairweather Front Range Complex
    - North Admiralty Complex
    - North Baranof Complex
    - Outer Islands Complex
    - Sitka Sound Complex
  - Mafics/Ultramafics
    - Ketchikan Mafics/Ultramafics

ecological character of the land and is accompanied by resource data (where available) in tables, charts, and appendices. Common mammal lists were generated for each subsection using MacDonald and Cook (1999). The land-human interaction sections were based on information from Goldschmidt and Haas (1998), Emmons (1991), Rakestraw (1994), Roppel (1991), and Conner and O'Haire (1988) coupled with local knowledge. Current uses of National Forest System lands were derived from the Modified 1997 Tongass Land and Resource Management Plan (USDA Forest Service 1999).

- **INACTIVE GLACIAL TERRAINS**
  - **ROUNDED MOUNTAINS**
    - Granitics
      - Bell Island Granitics
      - Etolin Granitics
      - Kuiu–POW Granitics
      - Misty Fiords Granitics
      - North Chichagof Granitics
      - Peril Strait Granitics
      - Thayer Lake Granitics
      - Ushk–Patterson Bay Granitics
    - Sedimentary, Carbonates
      - Freshwater Bay Carbonates
      - Hood–Gambier Bay Carbonates
      - Kook Lake Carbonates
      - North POW–Kuiu Carbonates
      - Point Adolphus Carbonates
    - Metasedimentary
      - Hetta Inlet Metasediments
      - Traitors Cove Metasediments
      - Wrangell Narrows Metasediments
    - Complex Sedimentary & Volcanics
      - Behm Canal Complex
      - Berg Bay Complex
      - Cape Fanshaw Complex
      - Chilkat Complex
      - Eastern Passage Complex
      - Holkam Bay Complex
      - Moira Sound Complex
      - Stikine Strait Complex
      - West Chichagof Complex
      - Zimovia Strait Complex
    - Volcanics
      - Central POW Volcanics
      - Clarence Strait Volcanics
      - South Admiralty Volcanics
      - Stephens Passage Volcanics
  - **HILLS**
    - Granitics
      - South POW Granitics
      - Thorne Arm Granitics
    - Sedimentary, Noncarbonates
      - Alvin Bay Sediments
      - Rowan Sediments
      - Salmon River Sediments
    - Complex Sedimentary & Volcanics
      - Boca De Quadra Complex
      - North POW Complex
    - Volcanics
      - Kake Volcanics
      - Kasaan Peninsula Volcanics
      - Sumner Strait Volcanics
  - **LOWLANDS**
    - Till Lowlands
      - Affeck Canal Till Lowlands
      - Central POW Till Lowlands
      - Duke Island Till Lowlands
      - Duncan Canal Till Lowlands
      - Elevenmile Till Lowlands
      - Foggy Bay Till Lowlands
      - Gulf of Esquibel till Lowlands
      - Klawock Inlet Till Lowlands
      - Mitchell-Hasselborg Till Lowlands
      - Skowl Arm Till Lowlands
      - Soda Bay Till Lowlands
      - Vixen Inlet Till Lowlands
    - Outwash Plains
      - Thomas Bay Outwash Plains
    - Glaciomarine Terraces
      - Stephens Passage Glaciomarine Terraces
    - Wave–cut Terraces
      - Outer Coast Wave–cut Terraces
- **POST–GLACIAL TERRAINS**
  - **VOLCANICS**
    - Mount Edgecumbe Volcanics
    - Princess Bay Volcanics

Active Glacial Terrains

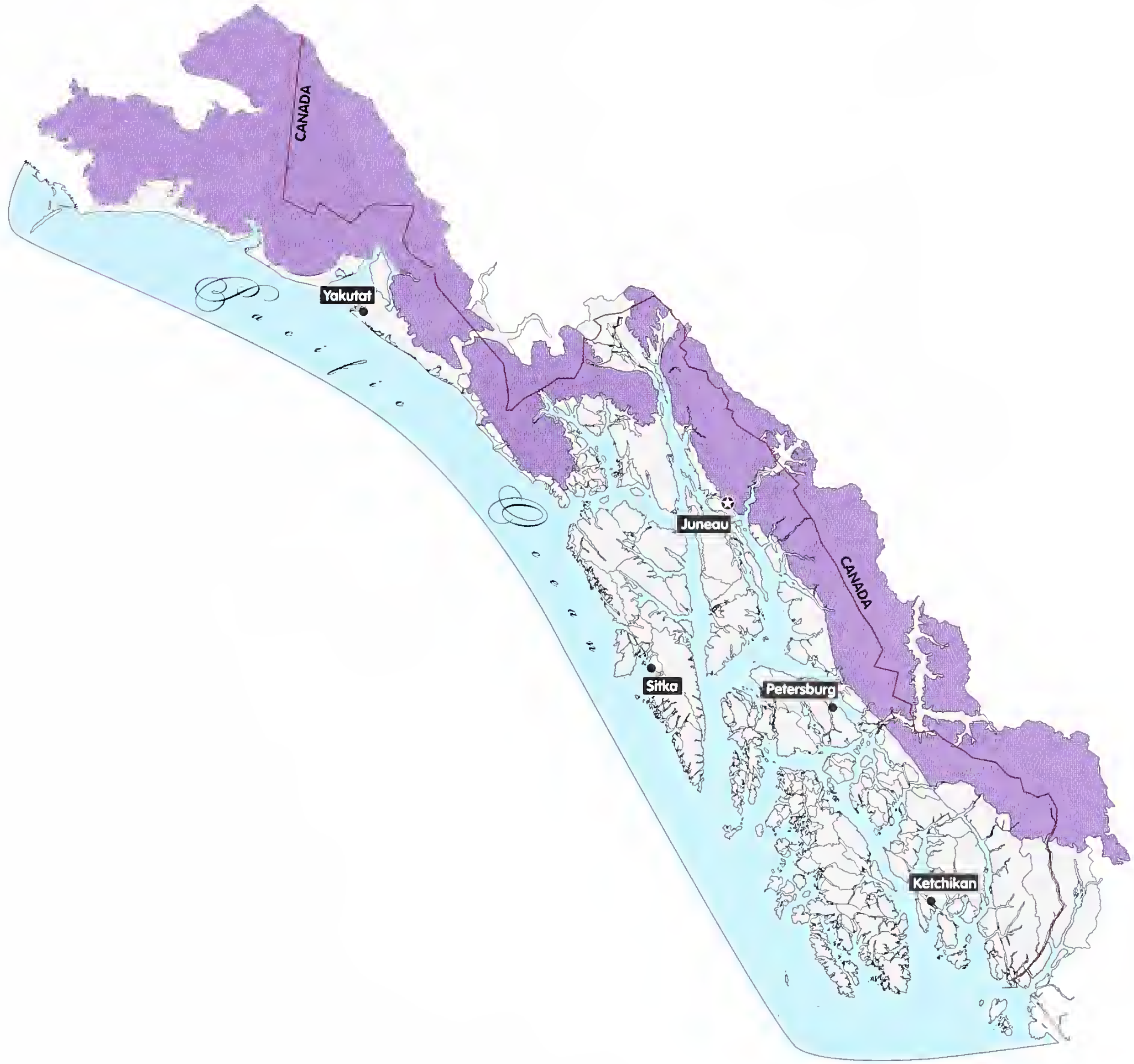
The largest system of temperate icefields and glaciers on the North American continent occurs within the coastal mountains of Southeast Alaska. The continuous stream of North Pacific moisture intercepted by these towering mountains spawns heavy snowfall and ice accumulation. During past glaciations, ice sheets swelled to enormous proportions, spilling from these mountains onto adjacent lands.

These are young, dynamic, and unstable landscapes that experience high rates of erosion and mass wasting. Stream channels are active, often adjusting their courses due to debris torrents, channel down cutting, and other *geomorphic processes*. Enormous volumes of meltwaters pouring from the large ice sheets and glaciers, coupled with *tectonic* uplift and *isostatic rebound*, produce some of the highest sedimentation rates in the world (Molnia 1986). As a result, vast *glaciofluvial* aprons, known as forelands, have formed along the outer coast. Glacial streams run heavy with silt, and their hydrology is linked to the timing of snow and ice melt rather than storm events. Summer flows are high, particularly during warm, sunny weather. In winter, these glacial-fed streams essentially shut down and often freeze to the bottom. Continual glacial retreat since the *Little Ice Age* (approx. 1450-1850) left behind many deglaciated surfaces where primary plant succession is occurring. Mineral soils forming in recently weathered materials often have weakly developed profiles and lack organic build-up.


CANADA
Yakutat
Pacific Ocean
Juneau
CANADA
Sitka
Petersburg
Ketchikan
Active Glacial Terrains

Icefields

An undulating matrix of icefields, snowfields, and glaciers covers the coastal mountains occasionally dissected by river valleys and perforated by *talus* slopes, rock cliffs, and small exposed peaks called "*nunataks*." Due to their shear height and geographic location, these mountains intercept huge amounts of moisture from the North Pacific Ocean. Past glaciations have carved out broad U-shaped valleys that often extend into *fjords* at sea level. High pyramidal peaks (*horns*) and knife-edged ridges (*arêtes*) flanked by steep, bowl-like slopes (*cirques*) are common topographic features of glacial activity.

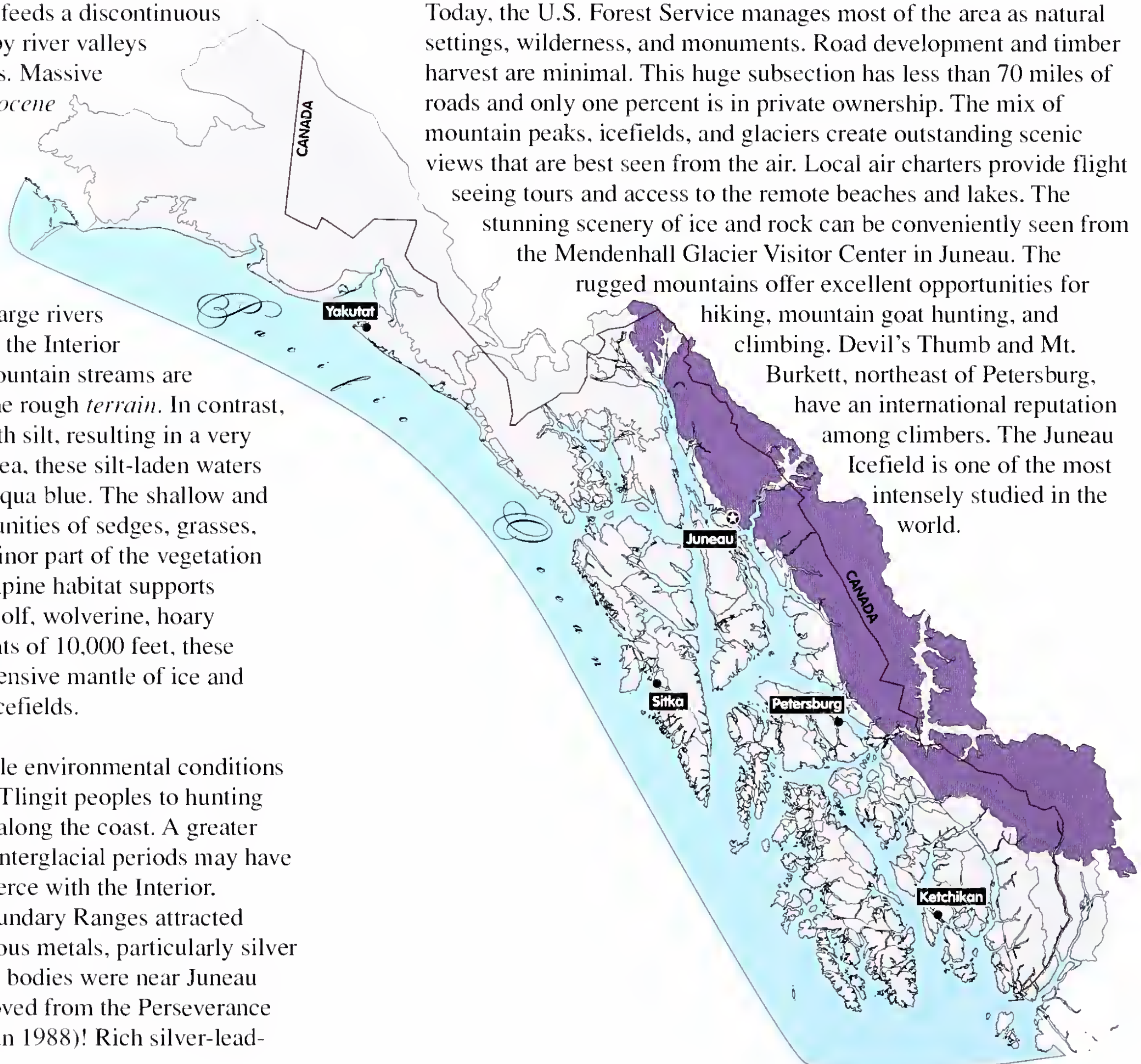

CANADA
Yakutat
Pacific Ocean
Juneau
CANADA
Sitka
Petersburg
Ketchikan

Boundary Ranges Icefields

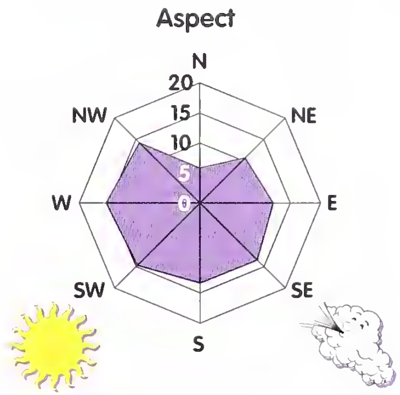
A northwest-southeast trending batholith of resistant granite and granodiorite underlies this portion of the Coast Mountains. High maritime precipitation, mostly as snow, feeds a discontinuous mix of icefields and glaciers separated by river valleys and pierced by *nunutaks* and *scree* fields. Massive ice sheets formed here during the *Pleistocene* and spread across the Alexander Archipelago (Pielou 1991). These ranges still harbor several sprawling icefields (e.g., Juneau and Stikine Icefields)—remnants of past ice ages. The southernmost tidewater glaciers in North America occur here. Only a few large rivers manage to breach these mountains from the Interior (e.g., Taku and Stikine Rivers). Most mountain streams are clear, high gradient, and contained by the rough *terrain*. In contrast, glacial meltwater streams are loaded with silt, resulting in a very cloudy appearance. When entering the sea, these silt-laden waters turn from a brownish tan to a milky or aqua blue. The shallow and rocky soils support low-growing communities of sedges, grasses, forbs, and shrubs. Forests comprise a minor part of the vegetation along coasts and rivers. The primarily alpine habitat supports mountain goat, brown and black bear, wolf, wolverine, hoary marmot, and ptarmigan. Reaching heights of 10,000 feet, these mountains are lower and have a less extensive mantle of ice and snow than the Saint Elias-Fairweather Icefields.

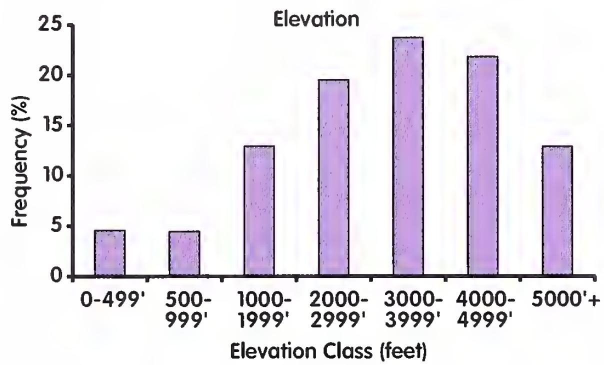
Land-Human Interactions. Unfavorable environmental conditions probably limited the activities of native Tlingit peoples to hunting and fishing within larger drainages and along the coast. A greater portion of ice-free land during warmer interglacial periods may have facilitated Native migrations and commerce with the Interior. Starting in the mid 19th century, the Boundary Ranges attracted waves of prospectors in pursuit of precious metals, particularly silver and gold (Roppel 1991). The largest ore bodies were near Juneau where over $90 million of ore was removed from the Perseverance and Alaska Juneau Mines alone (Redman 1988)! Rich silver-lead-gold ore bodies were also found at the head of Portland Canal.

Today, the U.S. Forest Service manages most of the area as natural settings, wilderness, and monuments. Road development and timber harvest are minimal. This huge subsection has less than 70 miles of roads and only one percent is in private ownership. The mix of mountain peaks, icefields, and glaciers create outstanding scenic views that are best seen from the air. Local air charters provide flight seeing tours and access to the remote beaches and lakes. The stunning scenery of ice and rock can be conveniently seen from the Mendenhall Glacier Visitor Center in Juneau. The rugged mountains offer excellent opportunities for hiking, mountain goat hunting, and climbing. Devil's Thumb and Mt. Burkett, northeast of Petersburg, have an international reputation among climbers. The Juneau Icefield is one of the most intensely studied in the world.



Looking northeast over the rugged mainland between the Speel River and the Whiting River. In places, the high, angular, ice-capped mountains give way to narrow, steep-walled valleys that are headed by active glaciers.

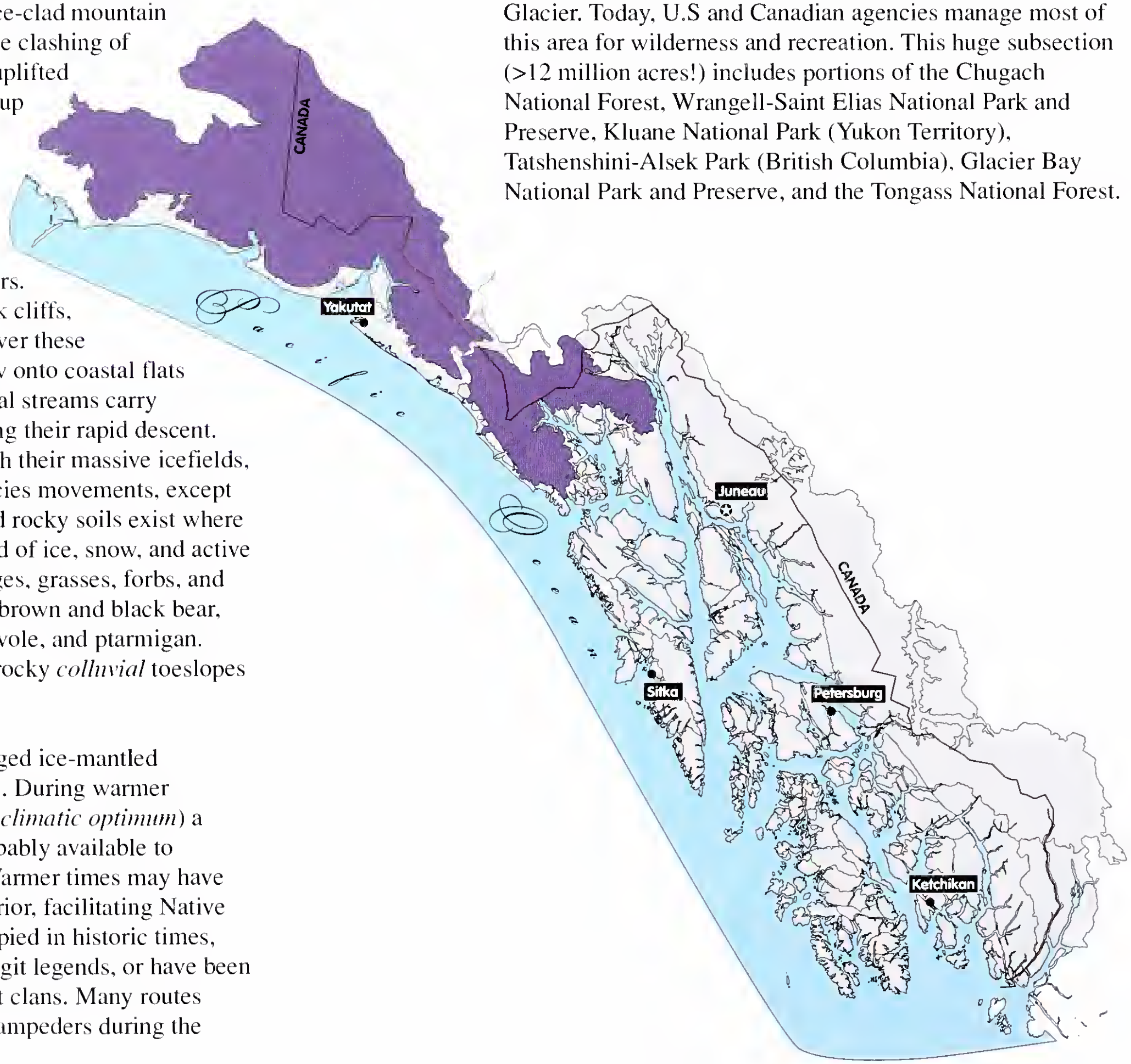




Boundary Ranges Icefields	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Summits (79%)	Mountain Slopes (16%)	Valley Floor (4%)			60
Parent Materials	Bedrock (46%)	Residuum (19%)	Ice & Snow (18%)	Colluvium (9%)	Organic Material (4%)	49
Soils	Miscellaneous (63%)	Histosols (14%)	Inceptisols (10%)	Spodosols (10%)	Entisols (3%)	60
Landcover	Alpine (77%)	Brush (5%)	Hemlock (4%)	Landslides (3%)	Hemlock-Spruce (2%)	100
Productivity	Nonforested (84%)	Nonproductive Forests (9%)	Productive Forests (7%)			96
Site Index	SI 0-40 (84%)	SI 41-60 (11%)	SI 61-80 (3%)	SI >80 (1%)		87
Wetlands	Upland (97%)	Lacustrine Limnetic (1%)	Riverine (1%)	Palustrine Scrub-Shrub (1%)	Palustrine Emergent (1%)	99
Stream Process Groups	High Gradient-Contained (67%)	Glacial Outwash (13%)	Alluvial Fan (5%)	Floodplain (4%)	Lake (4%)	
Land Use Designations	Mostly Natural Setting (62%)	Wilderness & Monument (32%)	Intensive Development (3%)	Moderate Development (2%)	Private (1%)	100

Saint Elias–Fairweather Icefields

Arcing *terranes* of Pacific origin have been thrust onto the North American continent forming a rugged ice-clad mountain chain adjacent to the Gulf of Alaska. The clashing of Pacific and North American plates has uplifted these mountains to incredible heights—up to 19,000 feet! These towering mountains of faulted and folded sedimentary rocks intercept an abundance of maritime moisture, mainly in the form of snow, resulting in huge icefields, snowfields, and glaciers. Except for occasional *nunataks* and rock cliffs, ice and snow form a continuous sheet over these mountains. Seaward, many glaciers flow onto coastal flats where they form expansive lobes. Glacial streams carry *bedloads* of cobbles, sand, and silt during their rapid descent. These towering mountains, together with their massive icefields, form an effective barrier to Interior species movements, except along the Alsek River corridor. Thin and rocky soils exist where mountain summits and slopes are devoid of ice, snow, and active *scree*. Here, alpine communities of sedges, grasses, forbs, and low shrubs are home to mountain goat, brown and black bear, wolf, wolverine, hoary marmot, tundra vole, and ptarmigan. Alder and willow brushfields occur on rocky *colluvial* toeslopes and *alluvial* valley bottoms.

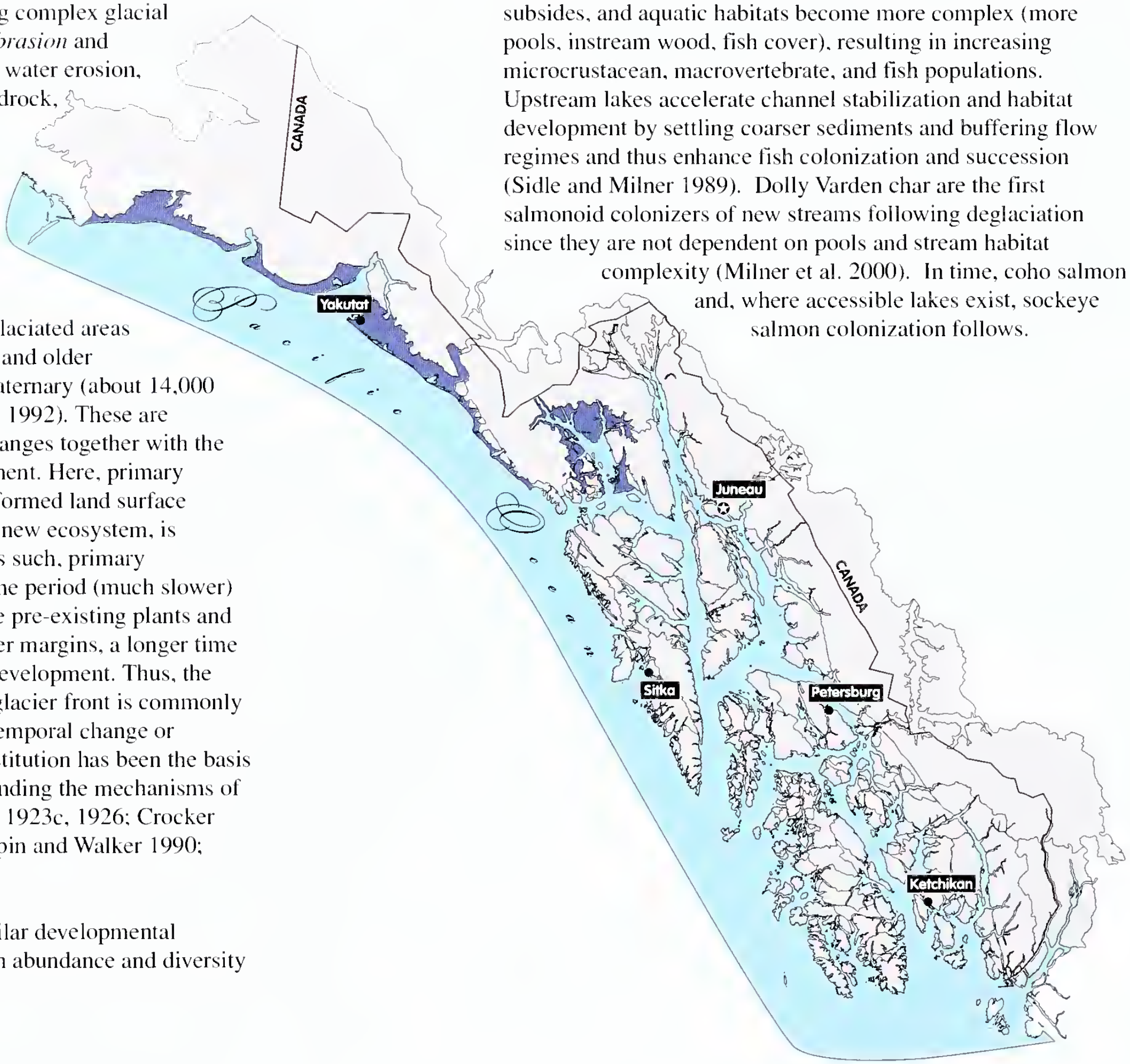


Land-Human Interactions. These rugged ice-mantled mountains have seen limited human use. During warmer interglacial periods (e.g., *Hypsithermal climatic optimum*) a greater portion of ice-free land was probably available to humans and the animals they hunted. Warmer times may have exposed additional corridors to the Interior, facilitating Native travel and commerce. Although unoccupied in historic times, several landforms are prominent in Tlingit legends, or have been incorporated as lineage crests by Tlingit clans. Many routes were tried across these mountains by stampeders during the Klondike Gold Rush, such as up and over the Nunatak Glacier. Today, U.S and Canadian agencies manage most of this area for wilderness and recreation. This huge subsection (>12 million acres!) includes portions of the Chugach National Forest, Wrangell-Saint Elias National Park and Preserve, Kluane National Park (Yukon Territory), Tatshenshini-Alsek Park (British Columbia), Glacier Bay National Park and Preserve, and the Tongass National Forest.

The Grand Pacific Glacier (lower right) is one of numerous large glaciers that originate in the St. Elias-Fairweather Icefields. Basal melting of temperate glaciers speed their travel. Glaciers act as conveyer belts, eroding and moving sediments as they flow. Note the development of linear medial deposits on top of the glacier through the accumulation and transport of debris scraped from the surrounding mountainsides.

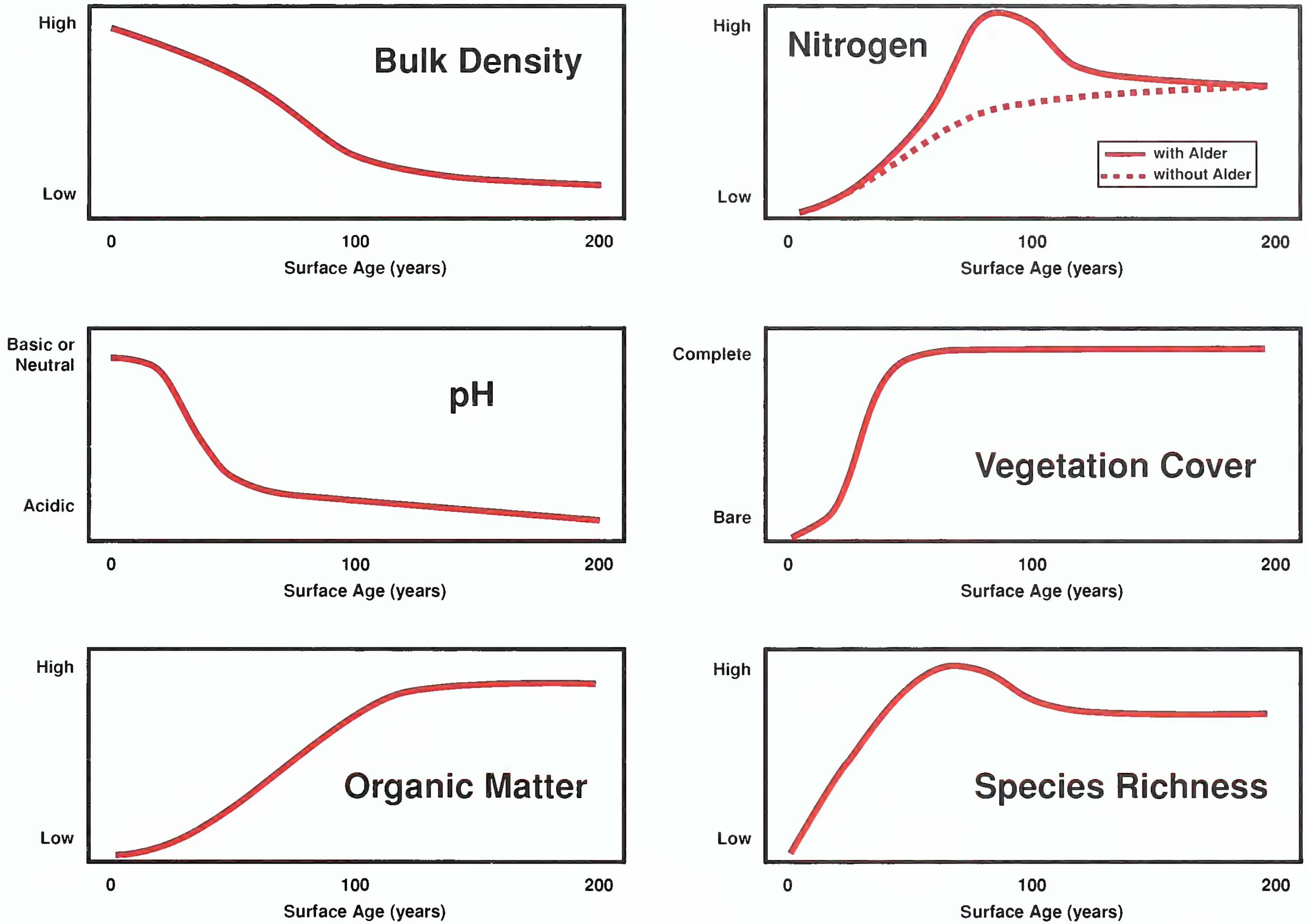
Recently Deglaciated Areas

These newly formed landscapes have emerged from the retreat of *neoglacial* ice since the *Little Ice Age* (1450-1850). These dynamic landscapes are far from uniform, reflecting complex glacial processes that include glacier scouring (*abrasion* and *plucking*), bedrock differences, subglacial water erosion, and depositional differences. Exposed bedrock, *till*, moraine, and outwash are common surfaces, whereas dunes, uplifted *glaciomarine* sediments, and beach ridges are less frequent features. These youthful areas are concentrated in Glacier Bay and along the outer mainland coast.



The unique characteristics of recently deglaciated areas distinguish them from the more extensive and older landscapes that emerged earlier in the Quaternary (about 14,000 years ago in Southeast Alaska) (Matthews 1992). These are developing landscapes where plant life changes together with the animals, the soil, and the *abiotic* environment. Here, primary vegetation succession, by which a newly formed land surface devoid of life is colonized and develops a new ecosystem, is intrinsically linked with soil formation. As such, primary succession unfolds over a much longer time period (much slower) than secondary succession where there are pre-existing plants and soils. With increasing distance from glacier margins, a longer time period has been available for ecosystem development. Thus, the pattern of ecosystems radiating from the glacier front is commonly interpreted as a spatial representation of temporal change or *chronosequence*. This space-for-time substitution has been the basis for many foundational studies in understanding the mechanisms of ecological change (Cooper 1923a, 1923b, 1923c, 1926; Crocker and Major 1955; Reiners et al. 1971; Chapin and Walker 1990; Fastie 1995).

Aquatic and fish communites display similar developmental patterns in recently deglaciated areas. Fish abundance and diversity is dependent on stream habitat complexity and stability (Milner et al. 2000). As streams age, channels stabilize, water turbidity subsides, and aquatic habitats become more complex (more pools, instream wood, fish cover), resulting in increasing microcrustacean, macrovertebrate, and fish populations. Upstream lakes accelerate channel stabilization and habitat development by settling coarser sediments and buffering flow regimes and thus enhance fish colonization and succession (Sidle and Milner 1989). Dolly Varden char are the first salmonoid colonizers of new streams following deglaciation since they are not dependent on pools and stream habitat complexity (Milner et al. 2000). In time, coho salmon and, where accessible lakes exist, sockeye salmon colonization follows.



Chronosequences portraying rapid changes of important soil and vegetation properties on recently deglaciated areas. Primary soil development and vegetation succession are diagnostic of these youthful areas, making them ecologically distinct from older, Post-Wisconsin surfaces (~14,000 yrs. old). The above trends are based on generalizations of Crocker and Major (1955) and Matthews (1992).

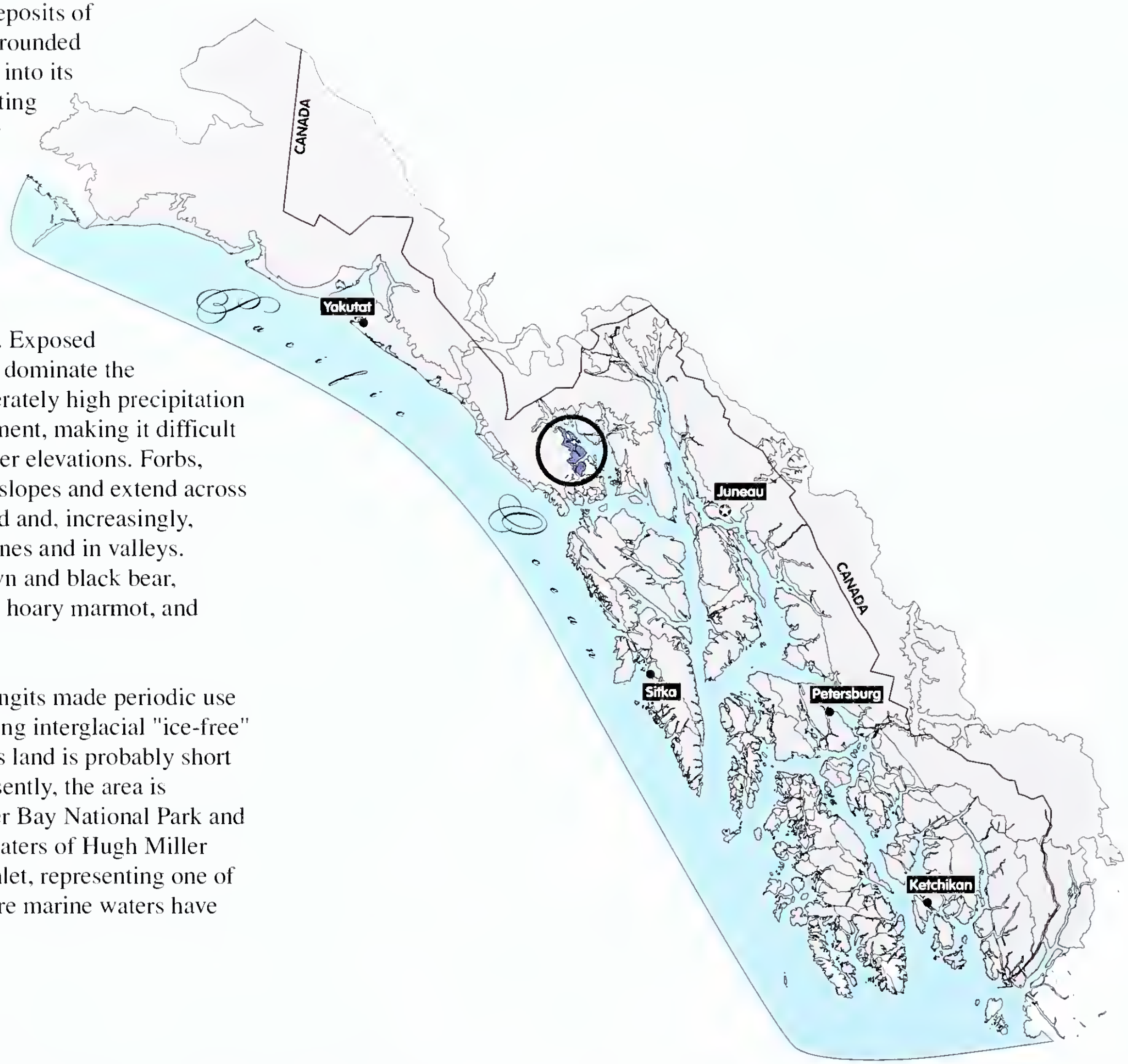
Exposed Bedrock

These terrestrial surfaces were extensively scoured by repeated *neoglacial* ice flows that exposed underlying bedrock. Bedrock erosion by glaciers is quite complex and involves a number of subglacial processes including *abrasion*, *plucking*, and water erosion (Matthews 1992). Soil formation proceeds extremely slowly as it is tied to the natural weathering of these hard surfaces. Primary plant succession, dependent on the development of soils, proceeds slowly as well. Crustose lichens are frequent pioneers of bedrock surfaces. Smooth surfaces originating from glacial *abrasion* and water erosion are the least favorable for plant colonization, whereas irregular surfaces (where pockets of debris can accumulate) due to glacial *plucking* are more favorable (Matthews 1992). Even so, the rate of soil development and vegetation succession on bedrock is at least an order of magnitude slower than on unconsolidated sediments (Matthews 1992). Here, stream courses are largely bedrock controlled, following the underlying structure of the rock. These primordial characteristics make for stark landscapes of raw, rugged beauty.

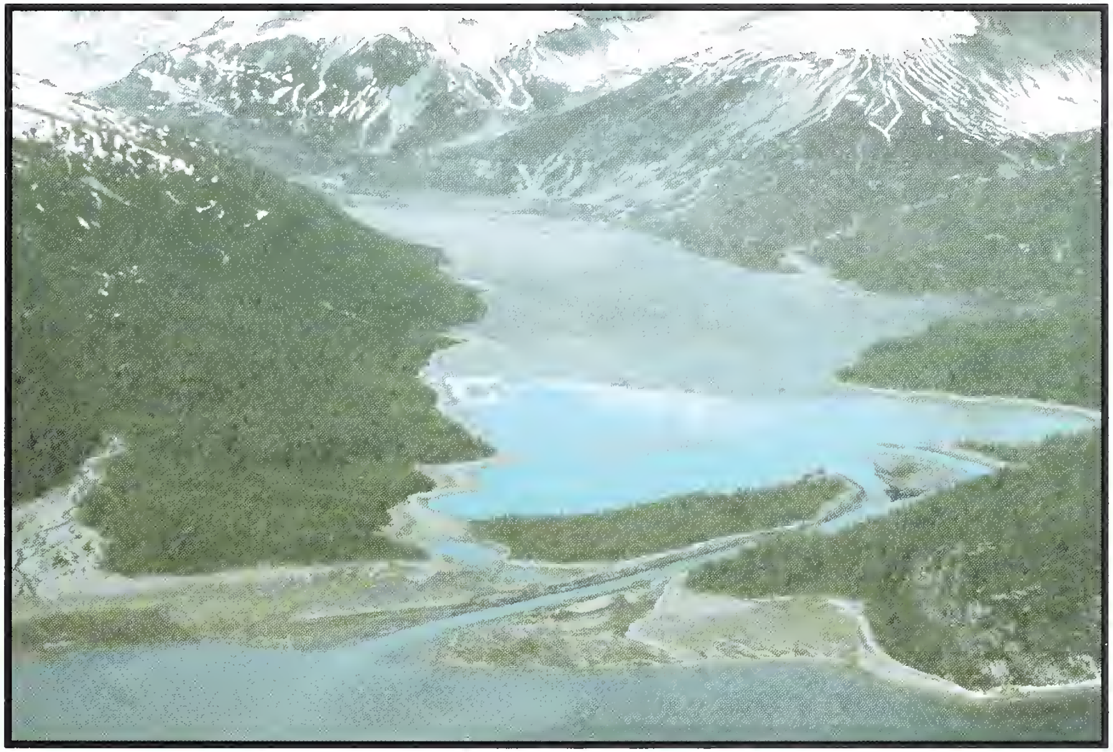

CANADA
Yakutat
Pacific Ocean
Juneau
CANADA
Sitka
Petersburg
Ketchikan

Hugh Miller-Geikie Inlet Mountains

Neoglacial ice has repeatedly scoured the west side of Glacier Bay exposing a mix of granitic, metasedimentary, and metavolcanic rocks. Here, fairly deep deposits of unconsolidated sediments surround the rounded mountains. Sediments continue to flush into its major valleys from meltwaters of retreating glaciers to the west. Several large *fjords* penetrate these mountains as they descend eastward into Glacier Bay. Because glaciers from the most recent advance encased this area in ice until the early 1900s, this youthful surface exhibits soil formation and vegetation colonization in the most primary stages. Exposed bedrock outcrops, devoid of vegetation, dominate the mountain scenery. Streams fed by moderately high precipitation routinely flush these mountains of sediment, making it difficult for plants to become established on upper elevations. Forbs, grasses, and shrubs fringe mountain toeslopes and extend across broad valleys and lowlands. Cottonwood and, increasingly, spruce trees are appearing along shorelines and in valleys. Common mammal species include brown and black bear, mountain goat, moose, wolf, wolverine, hoary marmot, and tundra vole.



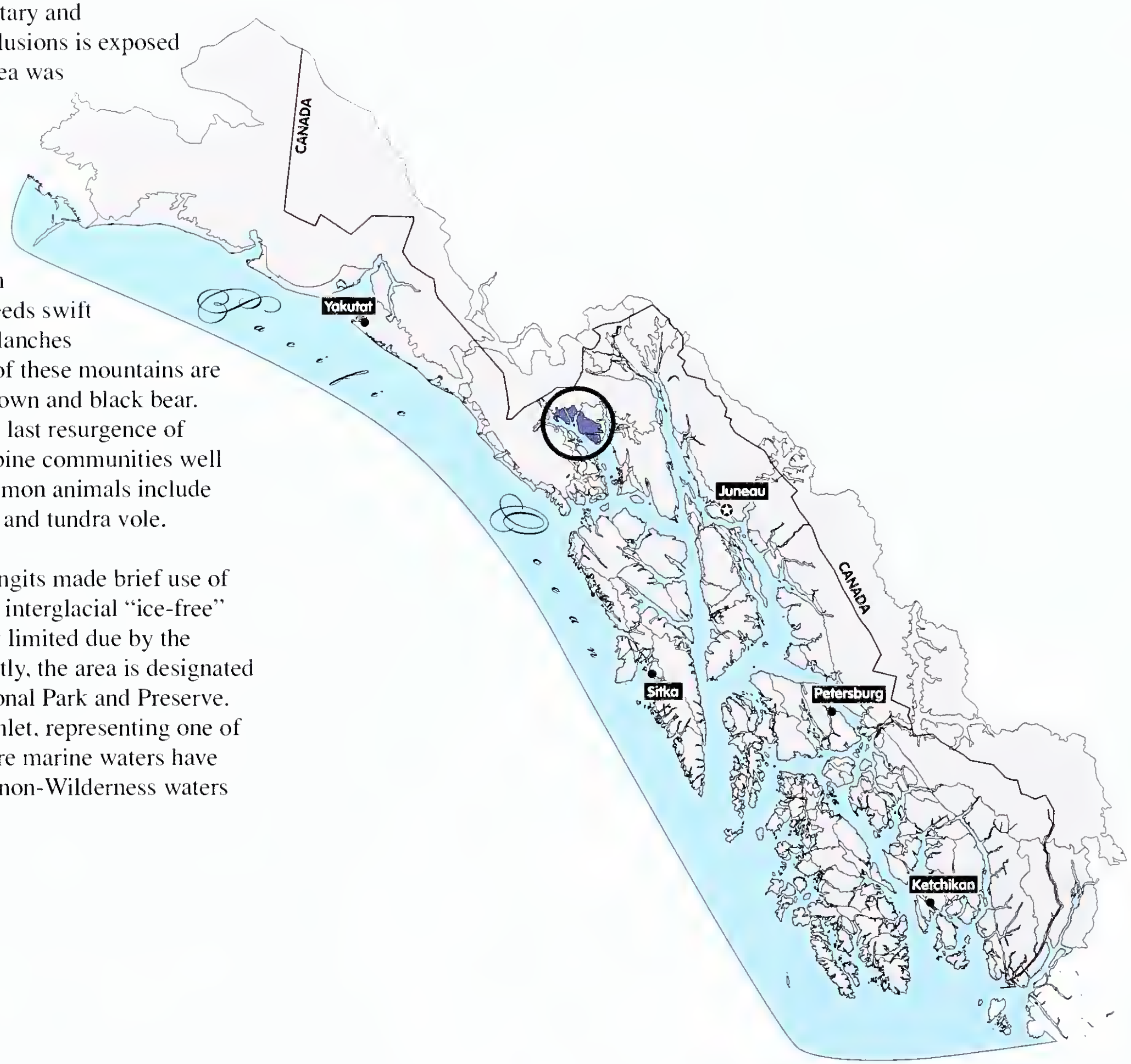
Land-Human Interactions. Native Tlingits made periodic use of this area and surrounding waters during interglacial "ice-free" times. The duration of Native use of this land is probably short given its recent liberation from ice. Presently, the area is designated wilderness within the Glacier Bay National Park and Preserve. Wilderness extends into the waters of Hugh Miller Inlet, Scidmore Bay, and Charpentier Inlet, representing one of the few places in Southeast Alaska where marine waters have this special designation.



The Hugh Miller Glacier (back center) represents one of many glaciers that pour into the Hugh Miller-Geikie Inlet Mountains from the west. Here, glacial meltwaters flow across outwash deposits into Weird Bay, then Scidmore Bay (foreground).

Queen–Tidal Inlet Mountains

Rugged angular mountains frame the northeast side of Glacier Bay's West Arm from Russell Island through Tidal Inlet. A mix of noncarbonate and carbonate sedimentary and metasedimentary rocks with granite inclusions is exposed throughout this stark landscape. This area was encased in *neoglacial* ice until the mid-1800s. It took 30 years of rapid glacial retreat (1860-1890) to fully reveal this landmass. Where previously covered in ice, the surface possesses youthful characteristics. Glacial drift was deposited in valleys and along mountain slopes. Moderately high precipitation feeds swift and clear mountain streams. Winter avalanches routinely sweep the slopes. The slopes of these mountains are lushly vegetated and heavily used by brown and black bear. Elevations above 2,400 feet escaped the last resurgence of *neoglacial* ice and have lush, mature alpine communities well populated by mountain goat. Other common animals include moose, wolf, wolverine, hoary marmot, and tundra vole.

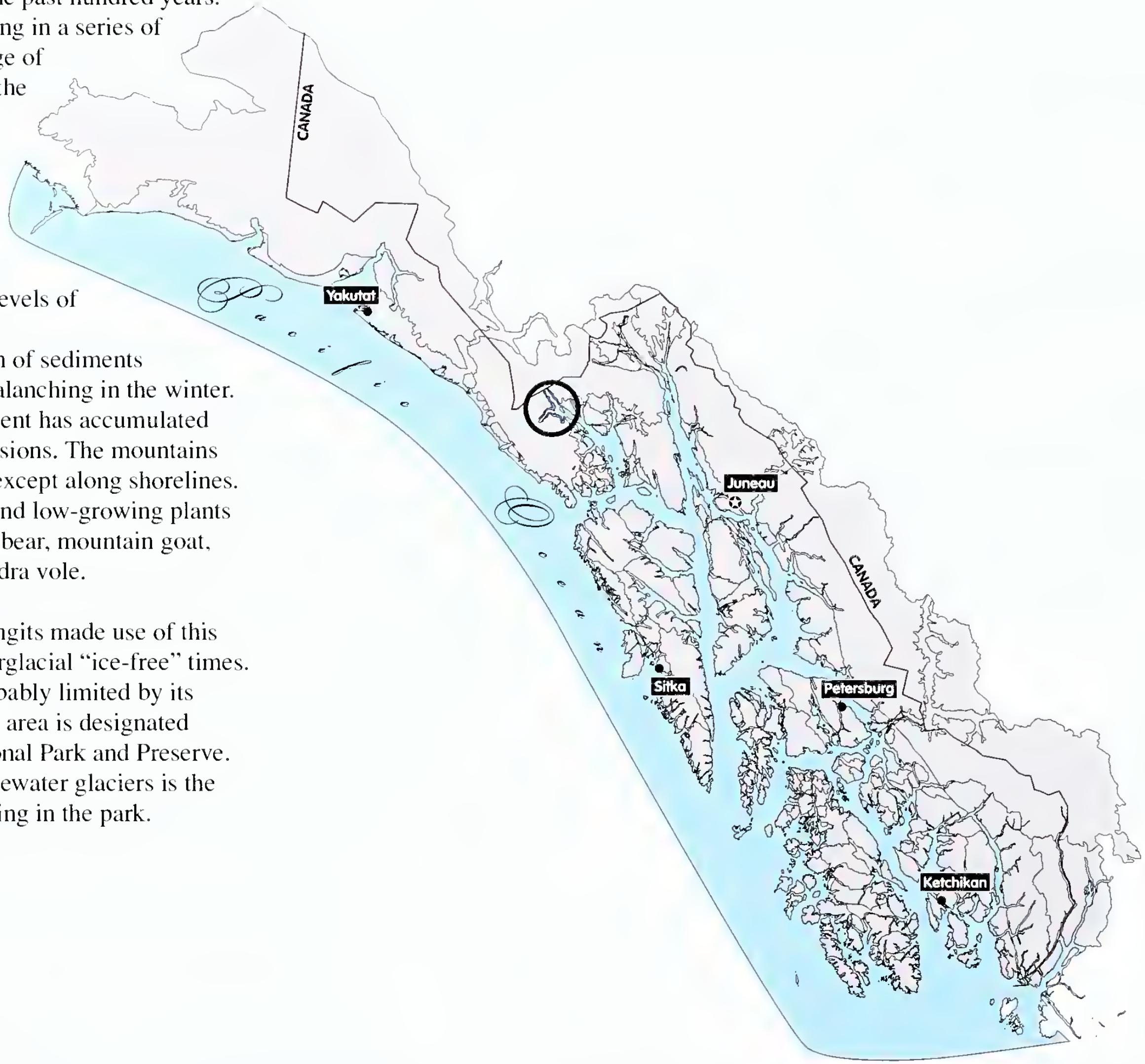


Land-Human Interactions. Native Tlingits made brief use of this area and surrounding waters during interglacial "ice-free" times. Historic Native use was probably limited due by the area's recent liberation from ice. Presently, the area is designated wilderness within the Glacier Bay National Park and Preserve. Wilderness waters exist within Rendu Inlet, representing one of the few places in Southeast Alaska where marine waters have this status. Tour boats routinely ply the non-Wilderness waters along this scenic subsection.

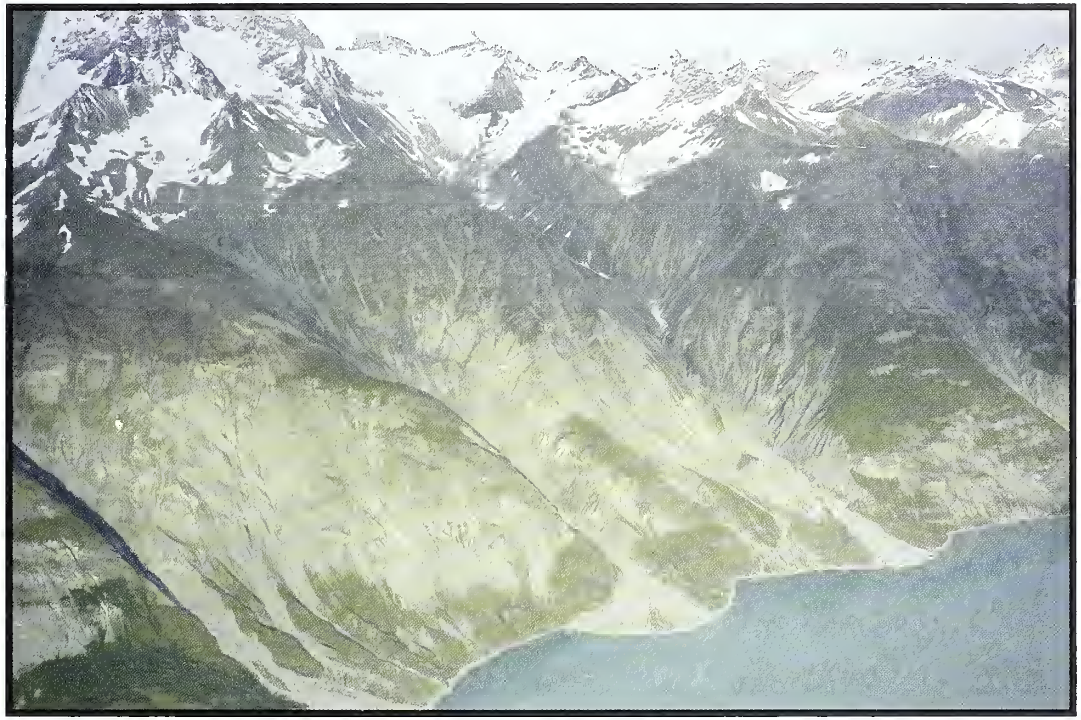
Steep, glacially scoured mountains abut Russell Passage (lower left) and Reid Inlet (far right) within the upper reaches of Glacier Bay. Here, alpine snowfields, barrens, and meadows cover much of the mountainous landscape. Forests and brushfields are restricted to lower elevations, mostly fringing the coastline.

Upper West Arm Mountains

These steep-walled, rugged mountains surround Glacier Bay at its northern limit, making for impressive scenery. Here, *neoglacial* ice retreated slowly during the past hundred years. Glacial activity has been erratic, occurring in a series of retreats and surges. Today, an assemblage of tidewater glaciers still exists, including the Reid, Johns Hopkins, Lamplugh, Margerie, and Grand Pacific Glaciers. These creep down mountain notches or along large fault zones, filling *fjords* with icebergs. Marine mammals, particularly seals, are common in these iceberg-laden waters. Moderately high levels of precipitation keep the granodiorite and metasedimentary masses relatively clean of sediments through rainwash in the summer and avalanching in the winter. Glacial deposits are sparse. Some sediment has accumulated along the shorelines and in small depressions. The mountains are largely devoid of soil and plant life except along shorelines. The open habitats of ice, rock barrens, and low-growing plants support limited use by brown and black bear, mountain goat, wolf, wolverine, hoary marmot, and tundra vole.



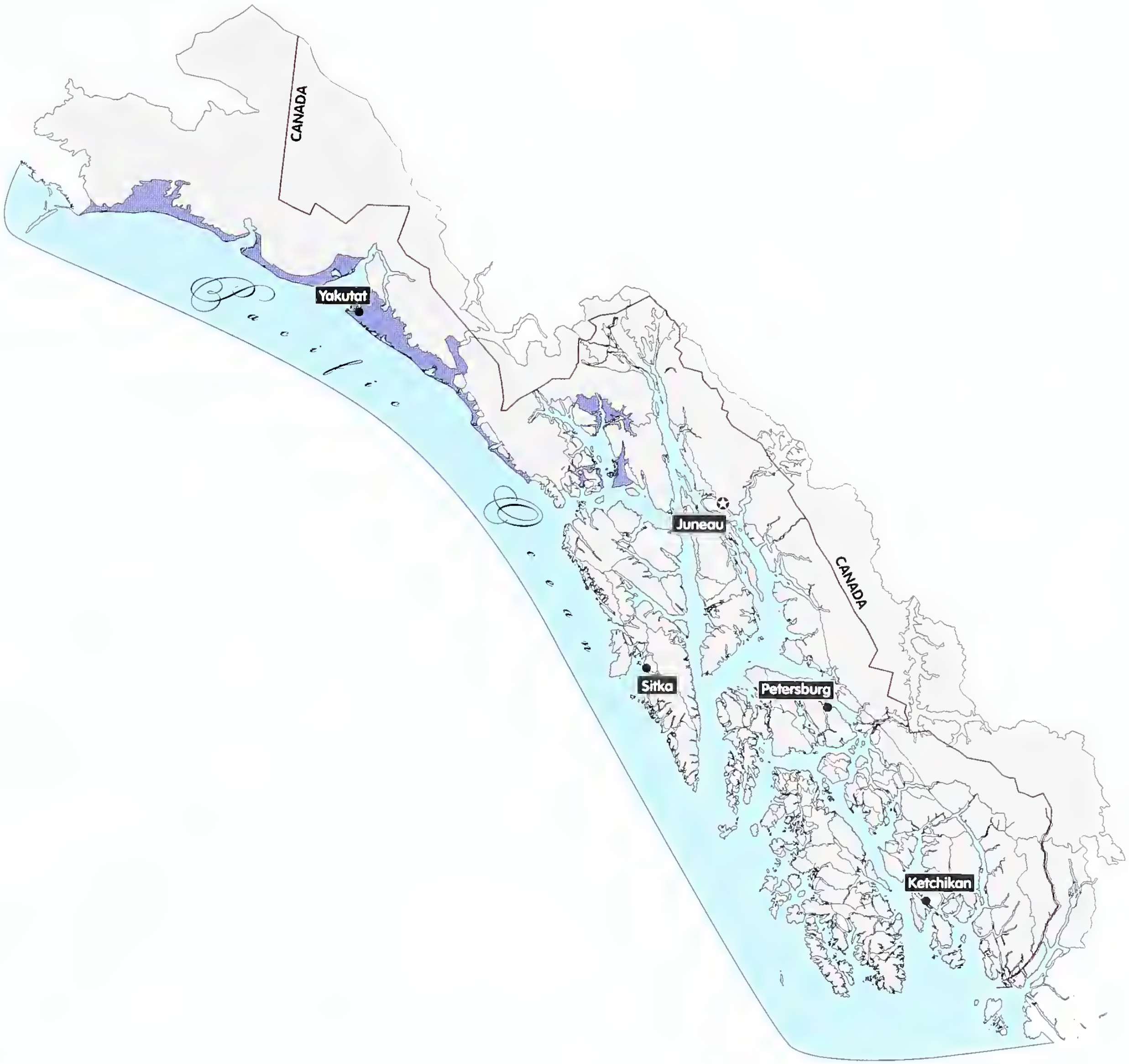
Land-Human Interactions. Native Tlingits made use of this area and surrounding waters during interglacial "ice-free" times. Historic Native use of this land was probably limited by its recent liberation from ice. Presently, the area is designated wilderness within the Glacier Bay National Park and Preserve. This steep-sided fjordland of calving tidewater glaciers is the primary destination of tour boats operating in the park.



The recent liberation of this mountainous fjordland from ice is vividly displayed along the east shore on Tarr Inlet. Steep, rocky mountainsides plunge to the sea largely devoid of vegetation, being swept regularly by winter avalanches and washed by summer rains. Rock debris and sediments have been transferred to the mouths of deeply incised valleys, forming deltaic fans. At lower elevations, early successional plants have a spotty distribution occurring where skeletal soils have developed on more stable surfaces.

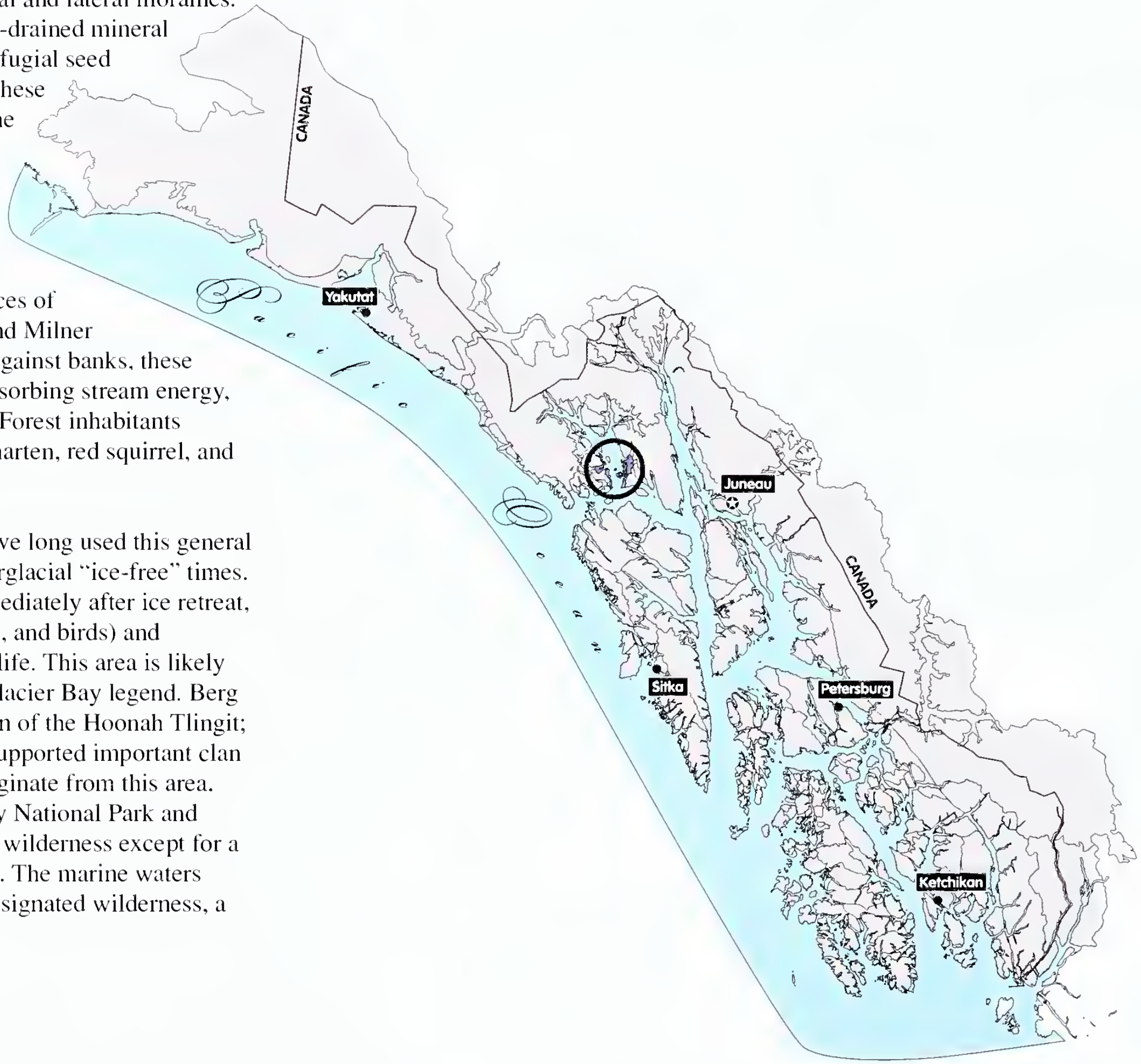
These youthful land surfaces were directly or indirectly affected by repeated *neoglacial* ice flows. In certain areas, glaciers deposited unconsolidated *tills* of mixed sizes (boulders to sands and silts). Undulating landscapes of moraines were left where the glaciers remained long enough in place. Meltwaters coursed over surfaces immediately in front of glaciers, covering them with coarse gravels and sands and forming outwash plains. These outwash plains are "pitted" where buried ice blocks subsequently melted leaving kettles or depressions. Finer-textured sediments from glacial meltwaters, mixing with larger particles imbedded in icebergs, settled out in lakes and marine waters to form *glaciolacustrine* and *glaciomarine* deposits, respectively. Stream development and character are vastly different within these unconsolidated surfaces compared to bedrock-controlled surfaces.

Regardless of origin, soil development and primary plant succession unfold much more quickly on substrates of unconsolidated materials compared to exposed bedrock, roughly an order of magnitude difference (Matthews 1992). The moraines of the Mendenhall Glacier represent a typical sequence of primary soil-vegetation change spanning 240 years (Alexander and Burt 1996; Burt and Alexander 1996). The leaching of morainal sediments begins early, even prior to the release from glacial ice. Immediately after glacier retreat, organic matter accumulates very slowly under the sparse cover of dwarf fireweed (10-year-old site). However, as alder and cottonwood thickets develop (38-year-old site), soil humus and organic matter accumulates rapidly. Soil pH progressively decreases with age. As soils approach 70 years and Sitka spruce replace alder, organic matter is lost from the surface mineral soil and distinct soil horizons begin to form. Where spruce-hemlock forest develops on surfaces over 240 years old, the soils take on appearances expected for mature forested sites. Although illustrative, this successional sequence and timeline will differ among areas based on proximity to seed sources (Fastie 1995) and speed of glacier retreat.


CANADA
Yakutat
Pacific Ocean
Juneau
CANADA
Sitka
Petersburg
Ketchikan

Berg–Beardslee Moraine

During the "*Little Ice Age*" ice overflowed lower Glacier Bay and spilled onto adjacent lands. Here, retreating and advancing *neoglacial* ice created a series of terminal and lateral moraines. The rolling surface is comprised of well-drained mineral soils of *till* origin. Close proximity of refugial seed sources caused trees to quickly occupy these soils after deglaciation (Fastie 1995). The area is now densely forested with first generation stands of Sitka spruce and some western hemlock. Mature cottonwood and alder forests that have developed on high terraces since deglaciation (early 1800s) are now sources of large woody debris for streams (Sidle and Milner 1990). By accumulating in-stream and against banks, these fallen materials stabilize channels by absorbing stream energy, armoring banks, and storing sediments. Forest inhabitants include moose, brown and black bear, marten, red squirrel, and the occasional Sitka black-tailed deer.

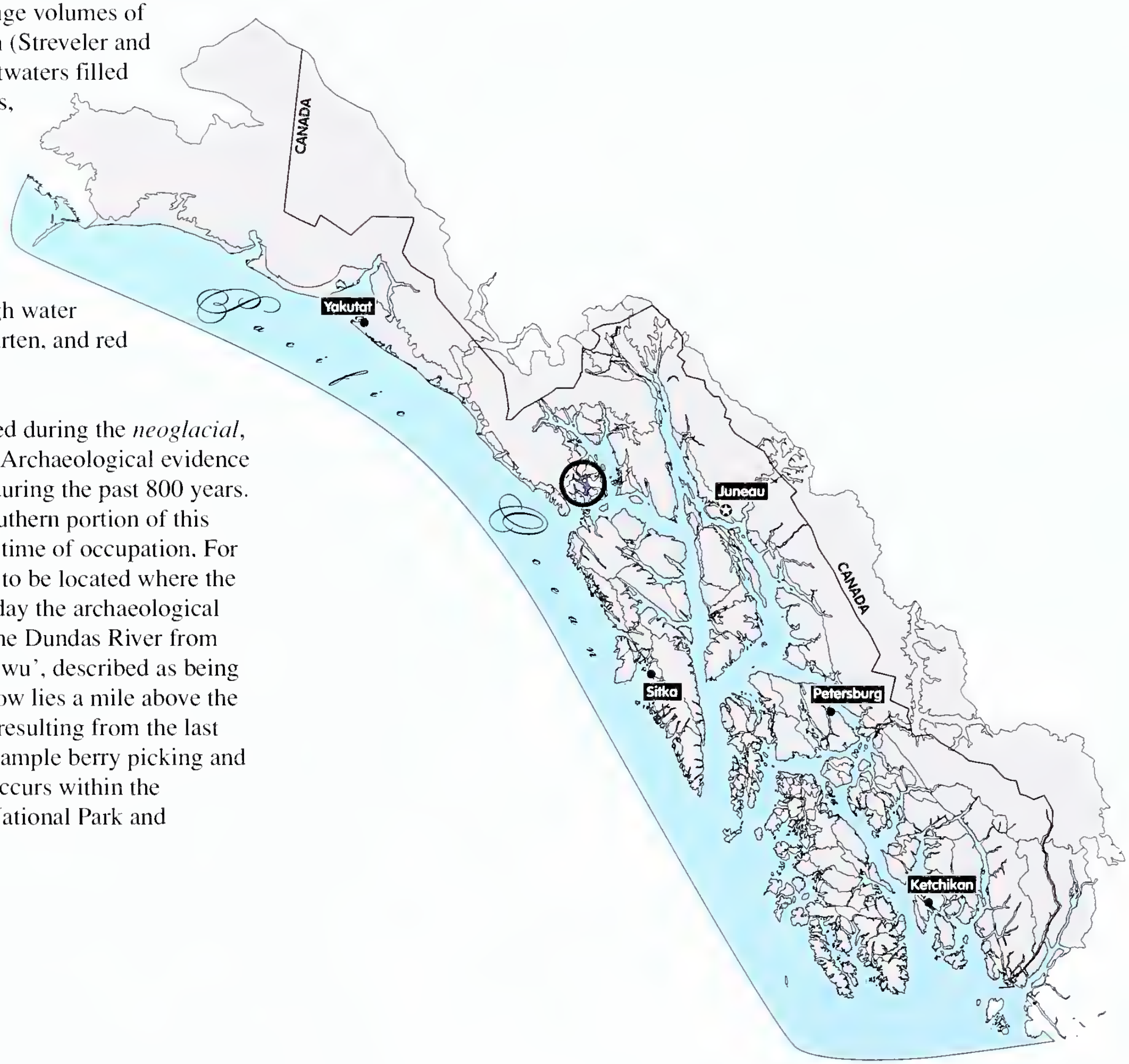


Land-Human Interactions. Natives have long used this general area and surrounding waters during interglacial "ice-free" times. Hoonah Tlingits occupied this area immediately after ice retreat, subsisting on the rich marine (fish, seals, and birds) and terrestrial (wild berries and vegetables) life. This area is likely the Tlingit homeland described in the Glacier Bay legend. Berg Bay is the origin of the Chookeneidi clan of the Hoonah Tlingit; Bartlett Cove and Point Gustavus also supported important clan houses. A number of Tlingit legends originate from this area. Today, the area is within the Glacier Bay National Park and Preserve. Most of the area is designated wilderness except for a small portion around Park Headquarters. The marine waters around the Beardslee Islands are also designated wilderness, a unique status in Southeast Alaska.

Looking north from Point Gustavus, rolling moraines line the eastern shores of Glacier Bay and underlie the Beardslee Islands (upper center). These well-drained, heavily forested moraines contrast sharply with the open, scrubby wetland complexes of the Gustavus Flats on the right.

Dundas River Flats

Glacial floods culminating about 250 years ago produced this intricate outwash plain. Apparently, *neoglacial* ice retreating from Geikie Inlet and Berg Bay shed huge volumes of meltwater into the Dundas River system (Streveler and Paige 1971). These sediment-laden meltwaters filled low-lying valleys with gravels and sands, providing coarse sediments that now support sparse forests of cottonwood, Sitka spruce, and lodgepole pine amongst Sitka alder and willow wetlands. The mineral soils are inherently wet due to low topography, moderately high precipitation, and a high water table. Moose, brown and black bear, marten, and red squirrel are common inhabitants.

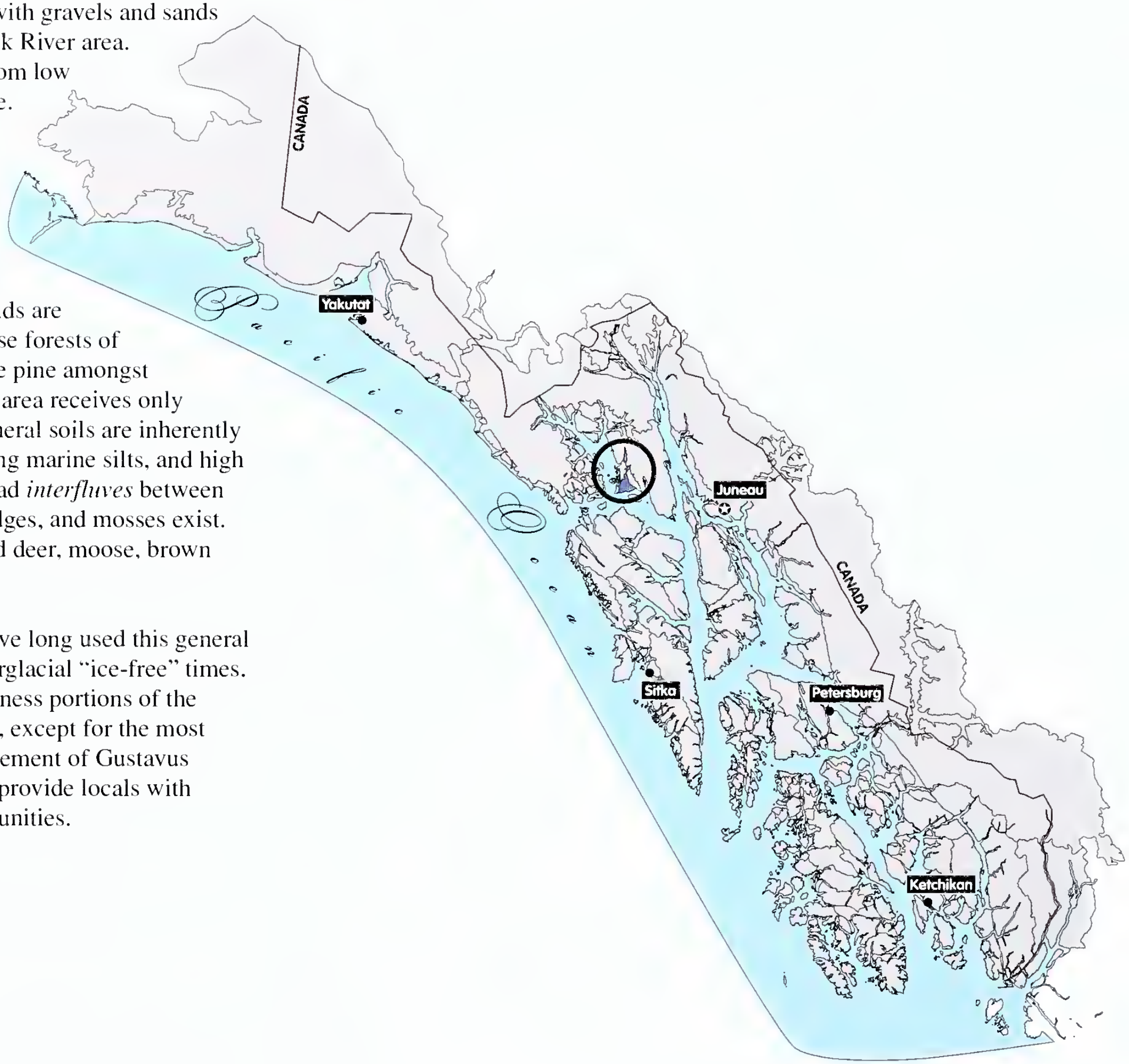


Land-Human Interactions. Unglaciated during the *neoglacial*, this land provided a refuge for humans. Archaeological evidence indicates fairly continuous occupation during the past 800 years. Tlingit legend identifies much of the southern portion of this area as being part of Dundas Bay at the time of occupation. For example, the village of L'istee was said to be located where the Dundas River flows into the bay, but today the archaeological remains of L'istee lie several miles up the Dundas River from the bay. A second site, Xunakawoo Noowu', described as being on an island at the mouth of the river, now lies a mile above the mouth of the river. The brushy habitats resulting from the last *neoglacial* flood provided Natives with ample berry picking and hunting opportunities. Today, the area occurs within the wilderness portion of the Glacier Bay National Park and Preserve.

The Dundas River meanders southeastward across broad wetland flats before emptying into Dundas Bay (far right center). These outwash flats formed when neoglacial floodwaters spilled down mountain valleys, filling them with coarse-textured sediments. The mouth of Glacier Bay lies behind the cloud-covered White Cap Mountain, which is part of the adjacent Berg Bay Complex.

Gustavus Flats

This sprawling outwash plain resulted from huge meltwater discharges during *neoglacial* retreat. Here, sediment-laden meltwaters inundated a former tideflat with gravels and sands from the Beardslee Islands and Beartrack River area. Gentle topographic features resulting from low gradient deposition dominate the surface. Here, predominantly small "underfit" *palustrine channels* follow relic glacial drainageways. The lower Salmon River, following one of a maze of late *neoglacial* river braids, bisects this gently sloping plain on its way to Icy Passage. The underlying well-sorted sands are very nutrient poor, supporting only sparse forests of cottonwood, Sitka spruce, and lodgepole pine amongst brushfields and poor fens. Although the area receives only moderate levels of precipitation, the mineral soils are inherently wet due to the flat topography, underlying marine silts, and high water table. The wettest sites are on broad *interfluves* between rivers where open fens of sweetgale, sedges, and mosses exist. These habitats support Sitka black-tailed deer, moose, brown and black bear, marten, and red squirrel.

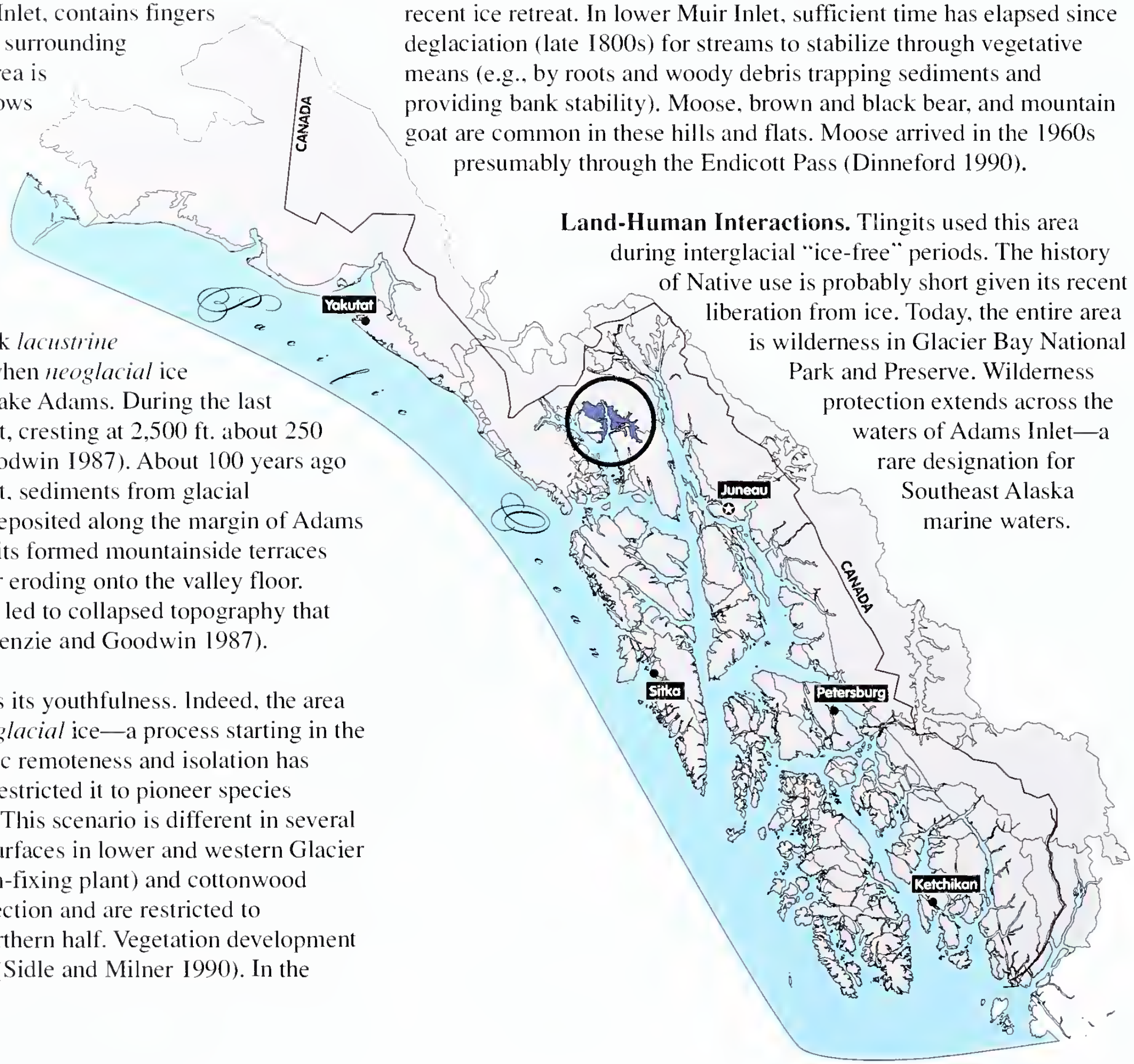


Land-Human Interactions. Natives have long used this general area and surrounding waters during interglacial "ice-free" times. Today, the area occurs within the wilderness portions of the Glacier Bay National Park and Preserve, except for the most *distal* portion, which comprises the settlement of Gustavus (15,000 acres). The flat brushy habitats provide locals with ample berry picking and hunting opportunities.

A large outwash plain formed by neoglacial floodwaters lines the north shore of Icy Strait (upper right). The foreground lobes of dense forests are part of the Berg-Beardslee Moraine where neoglacial ice stagnated and floodwaters emerged on its retreat. The Gustavus airport and community are located across the top of the photo.

Wachusett–Adams Hills

Thick layers of early- to mid-Holocene glacial outwash, *lacustrine* materials, and other glacial sediments cover this rolling *terrain*. This lowland basin, centered on upper Muir Inlet, contains fingers of low rolling hills that radiate from the surrounding mountains. The glacial history of this area is convoluted, with repeated *neoglacial* flows affecting individual inlets with each advance and retreat. For example, the Adams Inlet area has a wide range of deposits, including ice-contact *tills*, *lacustrine* sediments, *glaciofluvial* outwash, and *glaciomarine* deposits, all representing ice-water-land interactions (McKenzie and Goldthwait 1971). Thick *lacustrine* deposits are most notable, originating when *neoglacial* ice dammed the inlet and formed Glacial Lake Adams. During the last *neoglacial* period, ice filled Adams Inlet, cresting at 2,500 ft. about 250 yrs. ago (Reid 1892; McKenzie and Goodwin 1987). About 100 years ago ice was 1,300 ft thick. During ice retreat, sediments from glacial meltwaters and mountain runoff were deposited along the margin of Adams Inlet Glacier. These ice-marginal deposits formed mountainside terraces that are in various stages of slumping or eroding onto the valley floor. Melting ice buried in these deposits has led to collapsed topography that continues today (McKenzie 1969; McKenzie and Goodwin 1987).



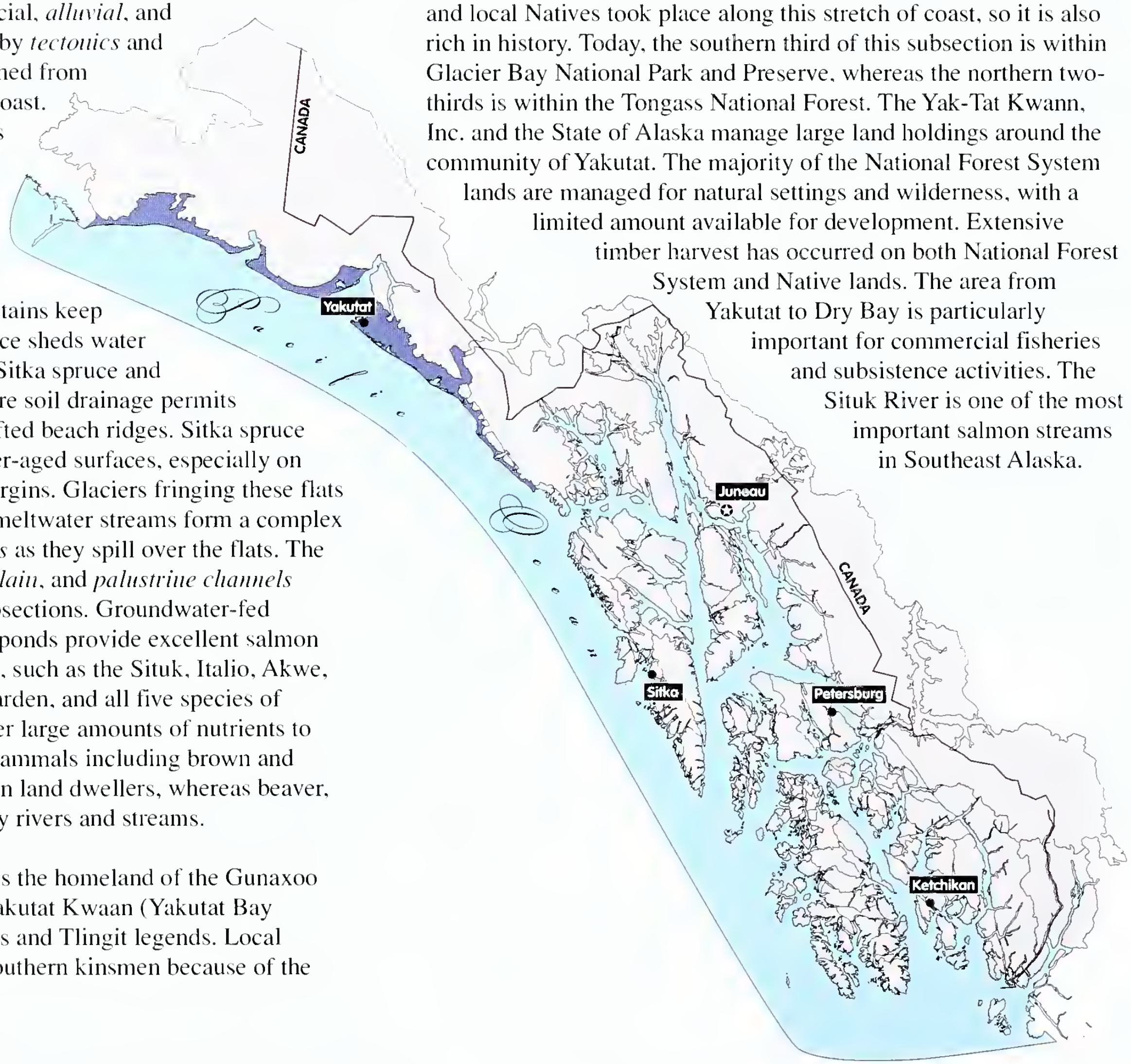
The unifying theme of this subsection is its youthfulness. Indeed, the area has been slow to escape the grip of *neoglacial* ice—a process starting in the 1860s and continuing today! Geographic remoteness and isolation has retarded primary plant succession and restricted it to pioneer species possessing light, wind-dispersed seeds. This scenario is different in several key respects from similar deglaciated surfaces in lower and western Glacier Bay (see Fastie 1995). Alder (a nitrogen-fixing plant) and cottonwood dominate the southern half of this subsection and are restricted to shorelines and valley bottoms in the northern half. Vegetation development plays a key role in stream morphology (Sidle and Milner 1990). In the barren upper portions of Muir Inlet, dynamic meltwater streams with very high sediment loads and *braided channels* have emerged from recent ice retreat. In lower Muir Inlet, sufficient time has elapsed since deglaciation (late 1800s) for streams to stabilize through vegetative means (e.g., by roots and woody debris trapping sediments and providing bank stability). Moose, brown and black bear, and mountain goat are common in these hills and flats. Moose arrived in the 1960s presumably through the Endicott Pass (Dinneford 1990).

Land-Human Interactions. Tlingits used this area during interglacial "ice-free" periods. The history of Native use is probably short given its recent liberation from ice. Today, the entire area is wilderness in Glacier Bay National Park and Preserve. Wilderness protection extends across the waters of Adams Inlet—a rare designation for Southeast Alaska marine waters.

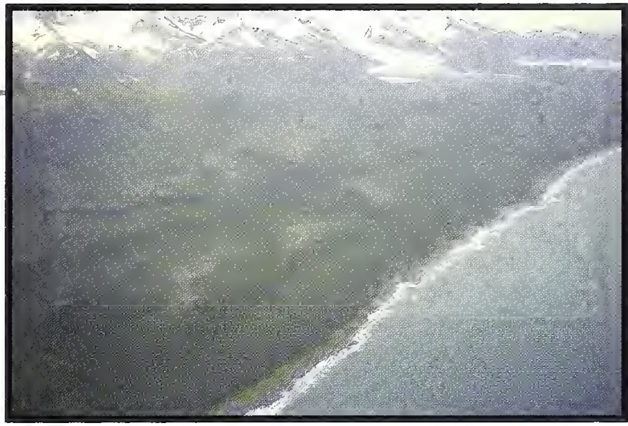
The recently deglaciated surface of the Wachusett-Adams Hills looking northeast across Casement Glacier outwash. The north shore of Adams Inlet appears at the upper right. Vegetation succession began after neoglacial ice retreat, starting in the early 1900s. Past glaciers have effectively eroded the mountains into rolling hills adjacent to the Adams Inlet basin.

Yakutat–Lituya Forelands

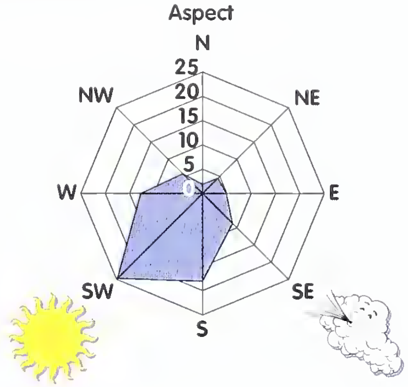
This foreland spreads seaward from the slopes of the St. Elias and Fairweather Mountains, forming a vast coastal plain. This gently sloping area is a complex of unconsolidated glacial, *alluvial*, and marine deposits that have been uplifted by *tectonics* and *isostatic rebound*. *Parabolic dunes*, formed from outwash sands, are scattered along the coast. Most are inactive and covered by forests or brushfields. The cool, maritime climate brings extended periods of overcast, fog, and precipitation. Winter snows are abundant and accumulate at sea level. Abundant precipitation and overland runoff from surrounding mountains keep the forelands perpetually wet. The surface sheds water slowly and is blanketed with wetlands. Sitka spruce and hemlock forests occur sporadically where soil drainage permits along stream levees, moraines, and uplifted beach ridges. Sitka spruce and cottonwood are common on younger-aged surfaces, especially on recent outwash deposits near glacier margins. Glaciers fringing these flats emit cold waters laden with silt. These meltwater streams form a complex web of interconnected, *braided channels* as they spill over the flats. The high percentage of *low-gradient*, *floodplain*, and *palustrine channels* make these forelands unique among subsections. Groundwater-fed ditches, intertidal sloughs, and wetland ponds provide excellent salmon rearing habitat. Streams and large rivers, such as the Situk, Italio, Akwe, and Doame, support steelhead, Dolly Varden, and all five species of Pacific salmon. Spawning salmon deliver large amounts of nutrients to aquatic and terrestrial systems. Large mammals including brown and black bear, moose, and wolf are common land dwellers, whereas beaver, muskrat, and river otter inhabit the many rivers and streams.



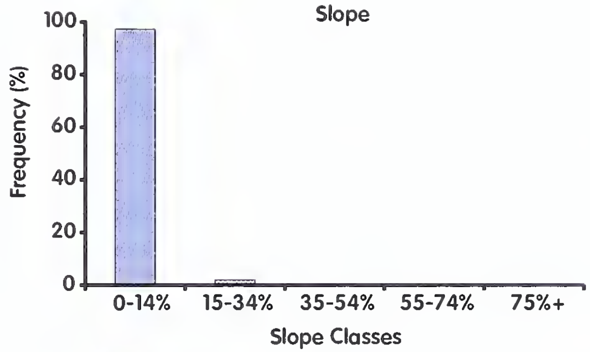
Land-Human Interactions. This area is the homeland of the Gunaxoo Kwaan (north from Dry Bay) and the Yakutat Kwaan (Yakutat Bay south), and is rich in archaeological sites and Tlingit legends. Local Tlingits were less seagoing then their southern kinsmen because of the abundant food resources of the forelands and its rivers (Goldschmidt and Haas 1998). Many of the earliest interactions between explorers and local Natives took place along this stretch of coast, so it is also rich in history. Today, the southern third of this subsection is within Glacier Bay National Park and Preserve, whereas the northern two-thirds is within the Tongass National Forest. The Yak-Tat Kwann, Inc. and the State of Alaska manage large land holdings around the community of Yakutat. The majority of the National Forest System lands are managed for natural settings and wilderness, with a limited amount available for development. Extensive timber harvest has occurred on both National Forest System and Native lands. The area from Yakutat to Dry Bay is particularly important for commercial fisheries and subsistence activities. The Situk River is one of the most important salmon streams in Southeast Alaska.

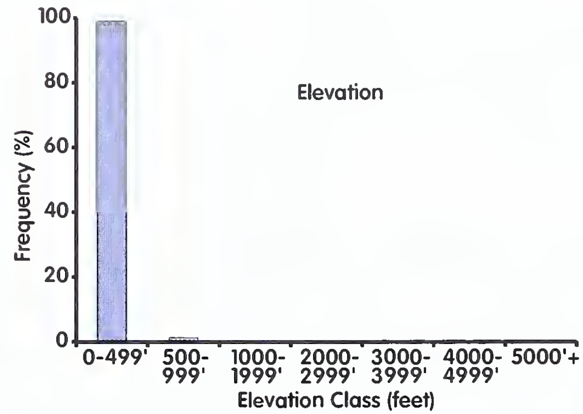


A vast foreland hugs the Gulf of Alaska formed by the seaward deposition of sediments from the coastal mountains. Glaciers, such as the LaPerouse Glacier shown above, continue to provide meltwaters and sediments that nurture this grand coastal wetland. Sedimentation, longshore transport, and tectonic activity have resulted in raised beach ridges immediately along the coast.



Yakutat-Lituya Forelands	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Lowlands (76%)	Valley Floor (11%)	Coastal (11%)	Mountain Slopes (1%)		76
Parent Materials	Alluvial (47%)	Organic Material (23%)	Glacial Outwash (17%)	Sand Dunes (7%)	Marine Beach (3%)	15
Soils	Entisols (50%)	Histosols (24%)	Spodosols (15%)	Miscellaneous (8%)	Inceptisols (3%)	15
Landcover	Spruce (27%)	Marsh (20%)	Brush (12%)	Lodgepole Pine (9%)	Poplar (8%)	100
Productivity	Productive Forests (49%)	Nonforested (34%)	Nonproductive Forests (17%)			100
Site Index	SI 0-40 (59%)	SI >80 (27%)	SI 61-80 (12%)	SI 41-60 (2%)		89
Wetlands	Upland (49%)	Palustrine Emergent (25%)	Palustrine Scrub-Shrub (13%)	Palustrine Forested (7%)	Estuarine Intertidal (2%)	100
Stream Process Groups	Floodplain (54%)	Palustrine (30%)	Glacial Outwash (8%)	Estuary (3%)	Lake (2%)	
Land Use Designations	Mostly Natural Setting (71%)	Wilderness & Monument (9%)	Private (8%)	Moderate Development (6%)	Intensive Development (6%)	100





Mainland Rivers

These large river systems breach (Alsek, Taku, and Stikine Rivers) or nearly breach (Chilkat River) the coastal mountains, thus serving as important climatic and migration corridors to the Interior. These are unique features on the mainland, as only a few Interior rivers were able to maintain their westward courses (through downcutting) during the rapid ascent of the coastal mountains (Lindsey and McPhail 1986). Rivers ancestral to the Alsek, Taku, and Stikine once drained larger areas, but their corriders were repeatedly plugged by *Pleistocene* ice encasing the mountains. Over time, much of their upper headwaters were captured by other river systems (e.g., Yukon River). Large glacial lakes often formed and, during glacial retreat, would breach the ice dams, sending large volumes of water and debris cascading down these rivers. These glacial outburst floods are called *jökulhlaups* (an Icelandic term pronounced "YUCK-a-lup").

Animals, plants, and people have long used these corridors during ice-free interglacial periods. Most recently, moose have exploited these corridors to establish populations along the coastal portions of Southeast Alaska (Dinneford 1990). Both Interior and coastal plants converge along these *riparian* corridors, forming unique plant assemblages. Only here did Natives use cottonwood, rather than cedar, to fashion dugout canoes (Goldschmidt and Haas 1998). The only large *delta* in Southeast Alaska occurs where the Stikine River empties into the protected waters of Dry Strait.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Valleys

These large mainland valleys cut through the rugged coastal mountains, thus connecting the continental interior and coastal maritime environments. These valleys serve as important ecological corridors, allowing passage of plants, animals, and humans during ice-free periods. These corridors, in part, contributed to the biotic recolonization of Southeast Alaska after past glaciations. Due to downcutting and glacial scouring over millennia, steep mountain walls with *colluvial* toeslopes often surround these valleys. Valley bottoms are filled with unconsolidated sediments that have eroded from surrounding surfaces. Much of the water coursing through these valleys originates from melting snow and ice. In accordance, water levels fluctuate seasonally, with high flows during the summer and low flows during the winter. When strong Interior winds occur at the same time as low flows, fine sediments exposed along riverbanks and in dried-up channels are blown downriver (*aeolian* processes). Along certain river segments, sand dunes may form. Rivers are quite dynamic due to changing water levels, occurrence of *jökulhlaups* (glacial outburst floods), and highly erodible bed substrates. Rivers often *braid* and meander over wide floodplains. Old meander scars and oxbows are common floodplain features, harboring freshwater wetlands, ponds, and lakes.


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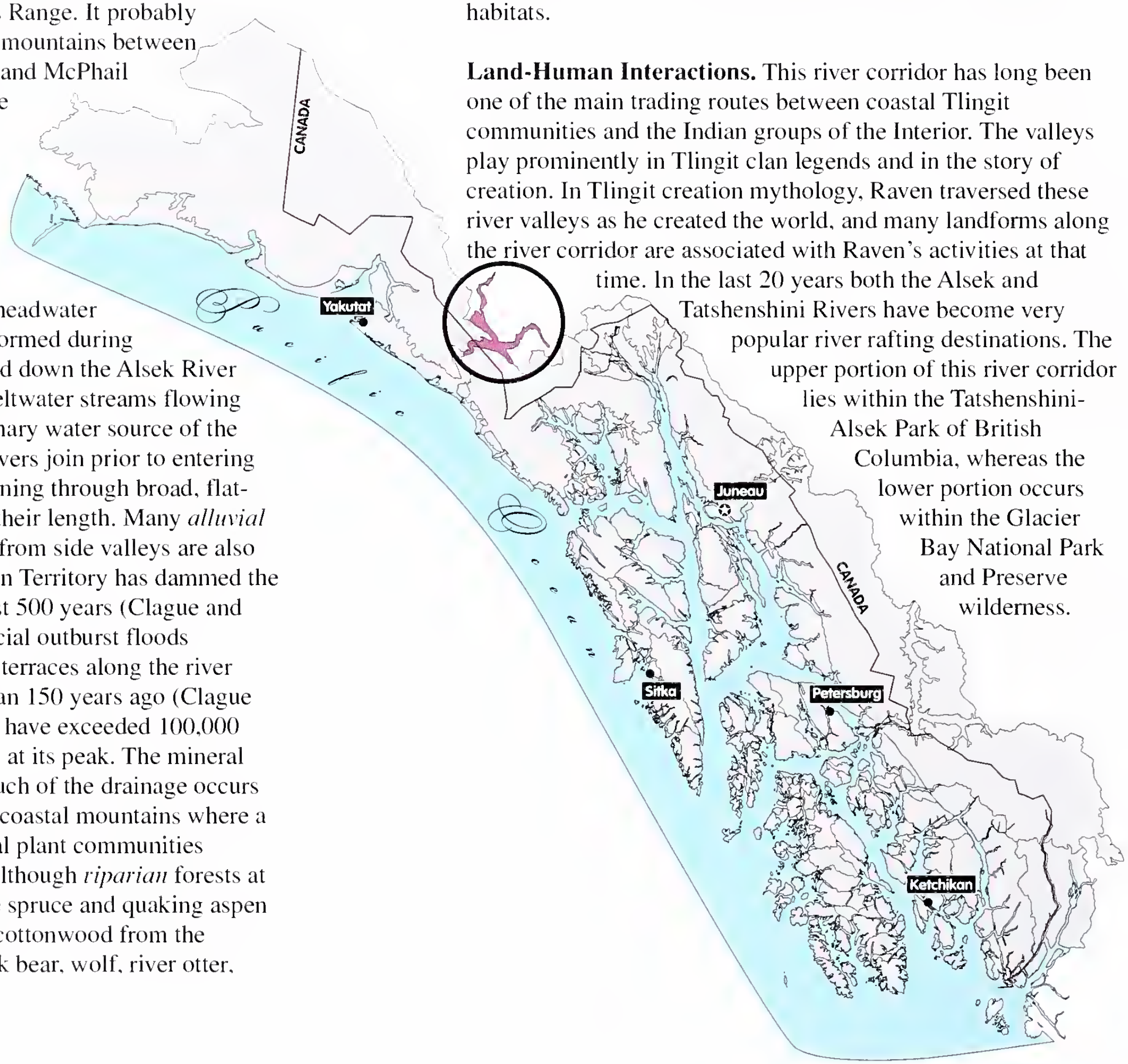
Alsek–Tatshenshini River Valleys

This is one of the few river systems originating in the Canadian Interior that passes through the St. Elias Range. It probably predates the interposition of the coastal mountains between the Yukon Plateau and the sea (Lindsey and McPhail 1986). The combined watershed of these rivers was much more extensive during the Miocene, draining most of southern Yukon Territory (Conner and O'Haire 1988). However, repeated glaciations impeded flow through the coastal mountains, allowing the Yukon River to pirate much of the headwaters. A huge headwater lake, called Glacial Lake Champagne, formed during the last ice retreat and eventually drained down the Alsek River (Lindsey and McPhail 1986). Today, meltwater streams flowing from the Alsek Ranges serve as the primary water source of the Alsek and Tatshenshini Rivers. These rivers join prior to entering the United States. *Braided channels* running through broad, flat-bottomed valleys characterize much of their length. Many *alluvial* terraces and coalescing fans emanating from side valleys are also present. The Lowell Glacier in the Yukon Territory has dammed the Alsek River at least four times in the last 500 years (Clague and Rampton 1982). The resulting huge glacial outburst floods (*jökulhlaups*) formed many of the large terraces along the river corridor. The last flood occurred less than 150 years ago (Clague and Rampton 1982). High flows in July have exceeded 100,000 cubic feet/second when glacial runoff is at its peak. The mineral soils in this corridor are very young. Much of the drainage occurs on the Interior (rainshadow) side of the coastal mountains where a drier continental climate prevails. Boreal plant communities predominate along much of its length, although *riparian* forests at its lower end contain a mixture of white spruce and quaking aspen from the continental interior and black cottonwood from the maritime coast. Moose, brown and black bear, wolf, river otter, mink, beaver, lynx and snowshoe hare populate the *riparian* habitats.



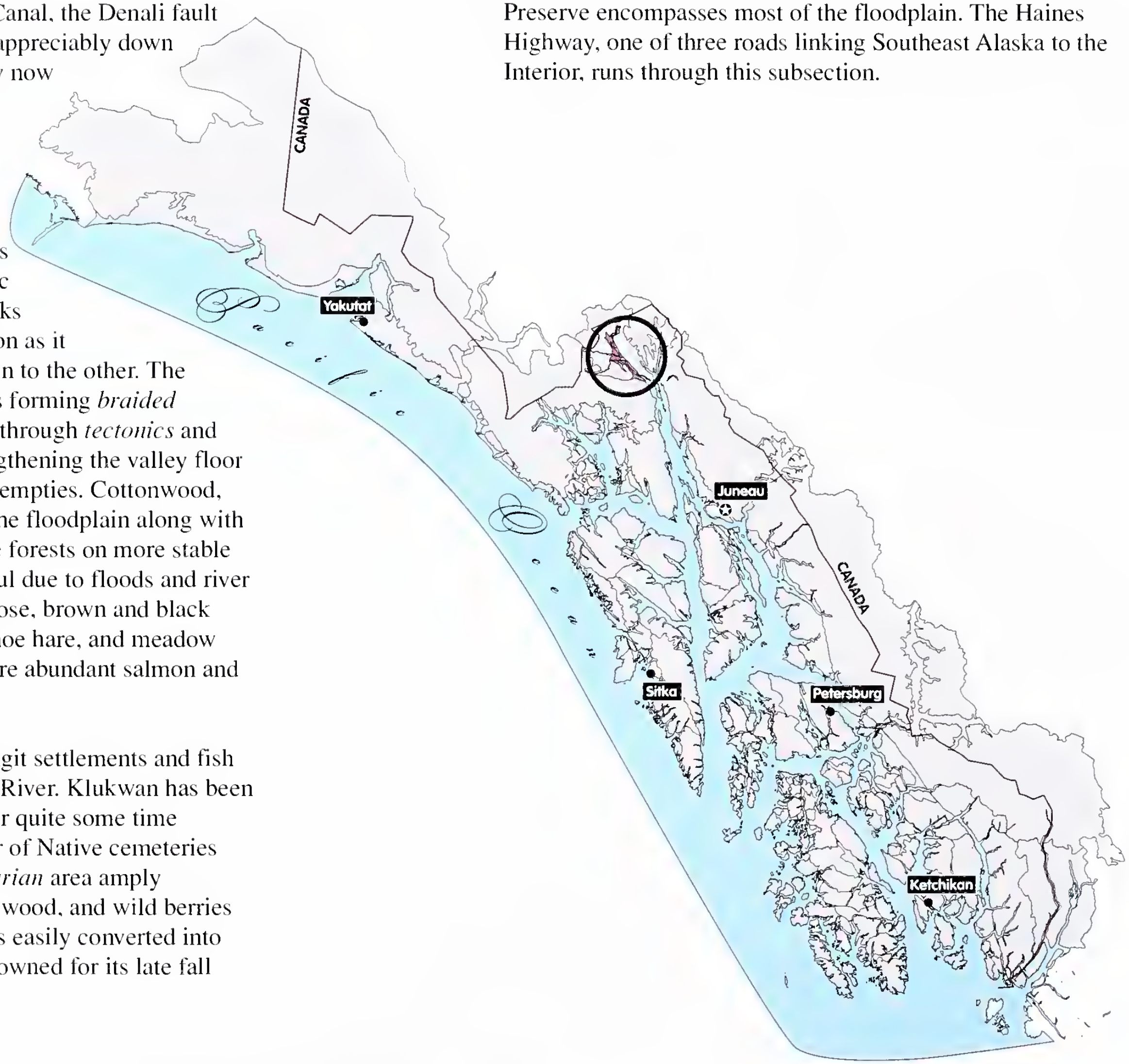
Land-Human Interactions. This river corridor has long been one of the main trading routes between coastal Tlingit communities and the Indian groups of the Interior. The valleys play prominently in Tlingit clan legends and in the story of creation. In Tlingit creation mythology, Raven traversed these river valleys as he created the world, and many landforms along the river corridor are associated with Raven's activities at that time. In the last 20 years both the Alsek and Tatshenshini Rivers have become very popular river rafting destinations. The upper portion of this river corridor lies within the Tatshenshini-Alsek Park of British Columbia, whereas the lower portion occurs within the Glacier Bay National Park and Preserve wilderness.

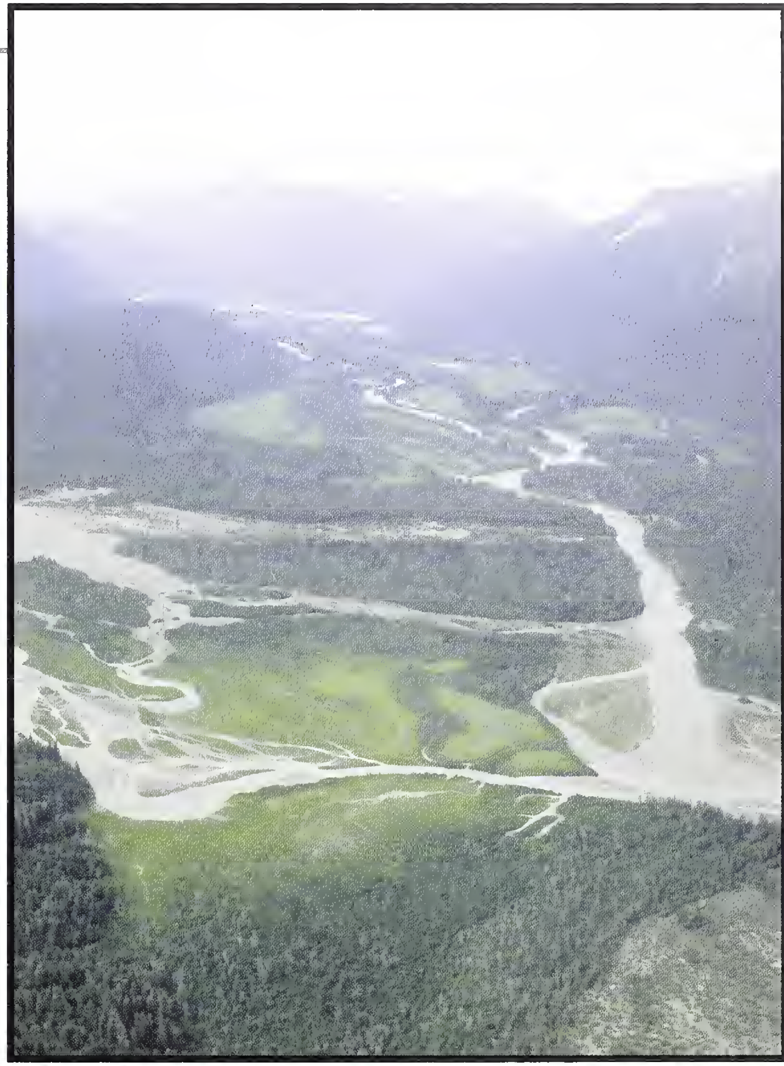
The waters of the Alsek form braided channels that meander through a broad valley floodplain. Note the glacial and alluvial materials spilling onto the floodplain from notches along the steep sideslopes. This photo looks eastward towards Canada where the Alsek cuts through the Saint Elias Range, one of the few mainland rivers to do so.

Chilkat River Valley

Continental glaciers scoured this region exploiting topographic and bedrock weaknesses to carve deep valleys and submarine trenches. Where it descends into Lynn Canal, the Denali fault represented a major bedrock weakness appreciably down cut by glaciers. This fault-derived valley now contains the Chilkat River. Here, after thousands of years of dumping glacial sediments, the Chilkat River and its tributaries have created an expansive floodplain. The unconsolidated riverwash floor of this floodplain affords little containment, making for a dynamic river system. The river constantly reworks sediments through erosion and deposition as it meanders from one side of the floodplain to the other. The river often divides into several segments forming *braided channels* with numerous islands. Uplift through *tectonics* and *isostatic rebound* has contributed to lengthening the valley floor at the expense of the *fjord* into which it empties. Cottonwood, willows, and alders dominate much of the floodplain along with some western hemlock and Sitka spruce forests on more stable sites. The mineral soils are quite youthful due to floods and river course changes over the floodplain. Moose, brown and black bear, marten, porcupine, beaver, snowshoe hare, and meadow vole inhabit the wooded floodplain where abundant salmon and eulachon runs occur.

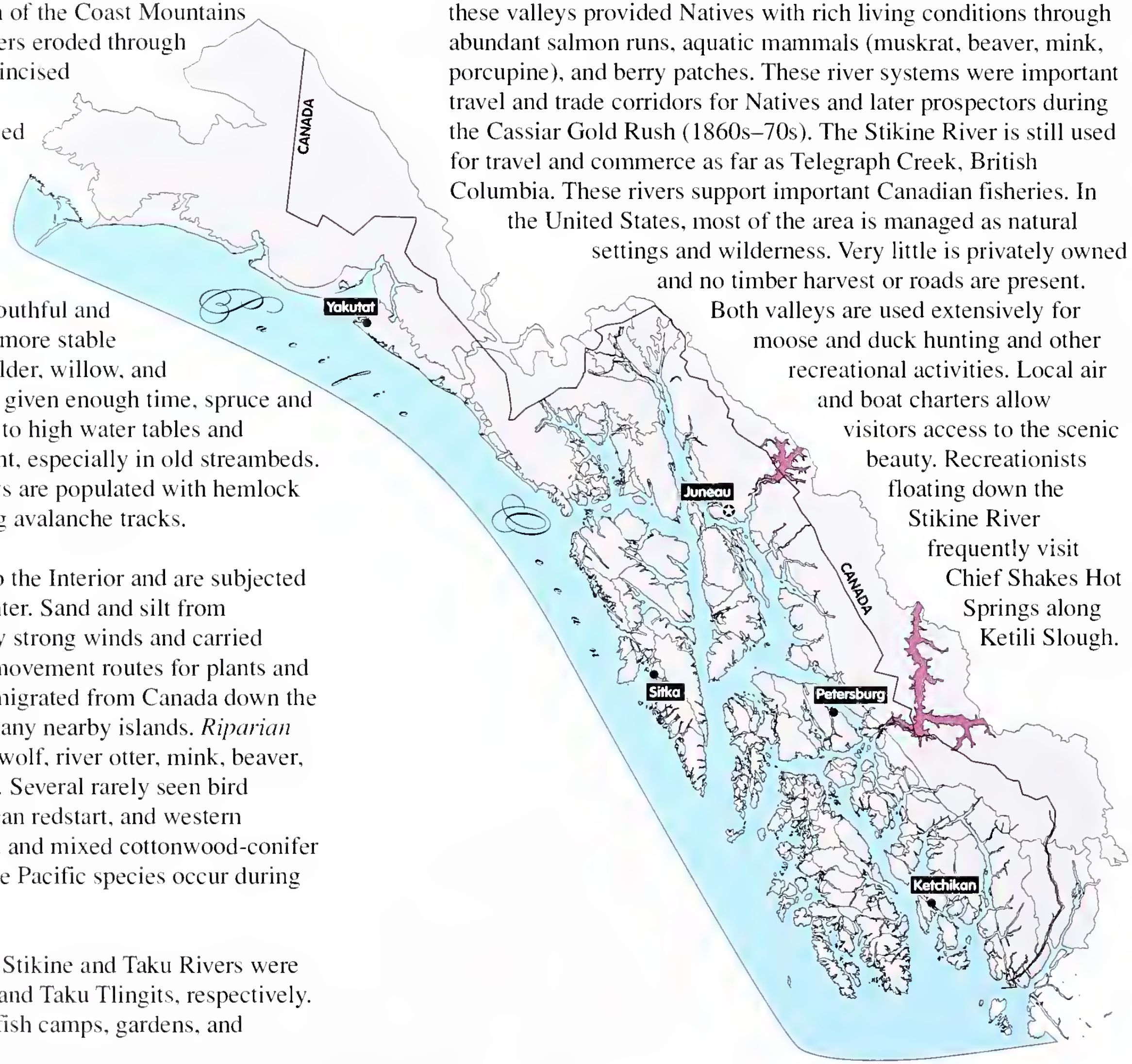
Land-Human Interactions. Many Tlingit settlements and fish camps were scattered along the Chilkat River. Klukwan has been the chief home of the Chilkat Indians for quite some time (Goldshmidt and Haas 1998). A number of Native cemeteries are located around the village. This *riparian* area amply supported them with salmon, eulachon, wood, and wild berries and vegetables. Also, the flat terrain was easily converted into gardens. The Chilkat River is world renowned for its late fall salmon runs which attract high concentrations of foraging bald eagles. The state-managed Alaska Chilkat Bald Eagle Preserve encompasses most of the floodplain. The Haines Highway, one of three roads linking Southeast Alaska to the Interior, runs through this subsection.





Braided channels carrying waters of the Chilkat meander across a broad floodplain at the head of Lynn Canal. The coarse, unconsolidated sediments of the floodplain provide little containment to the river. This photo looks northeastward over the middle portion of the Chilkat River.

Stikine-Taku River Valleys



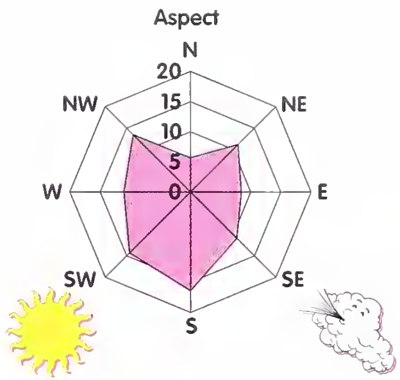
Rivers ancestral to the Stikine and Taku probably flowed from the Interior to the sea prior to the formation of the Coast Mountains (Lindsey and McPhail 1986). These rivers eroded through the uplifting mountains to form deeply incised corridors. They drain large portions of interior British Columbia and are fortified by sediment-laden meltwaters as they pass through the Boundary Ranges. River flow is highest in summer, a result of snow and ice melt. As the rivers meander, sediments erode and redeposit. As a result, valley soils are youthful and poorly developed, whereas soils on the more stable slopes are older and more developed. Alder, willow, and cottonwood colonize new deposits and, given enough time, spruce and hemlock may become established. Due to high water tables and flooding, *riparian* wetlands are abundant, especially in old streambeds. Mountain sideslopes abutting the valleys are populated with hemlock and spruce, with alder brushfields lining avalanche tracks.

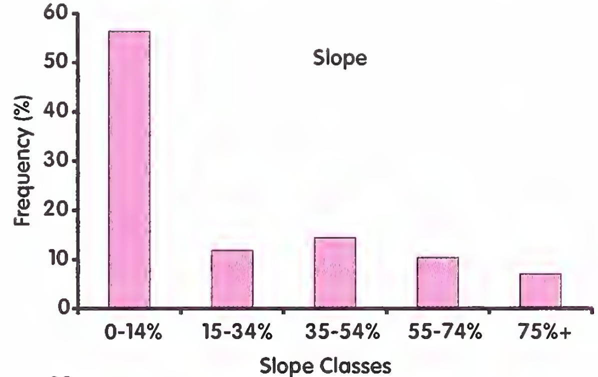
These valleys form climatic corridors to the Interior and are subjected to strong down valley winds during winter. Sand and silt from unvegetated riverbanks are picked up by strong winds and carried down valley. These are also important movement routes for plants and animals. In recent years, moose have emigrated from Canada down the Stikine River to the coast, colonizing many nearby islands. *Riparian* habitats support brown and black bear, wolf, river otter, mink, beaver, lynx, snowshoe hare, and meadow vole. Several rarely seen bird species, such as warbling vireo, American redstart, and western tanager, are common in the cottonwood and mixed cottonwood-conifer forests. Abundant salmon runs of all five Pacific species occur during high water periods.

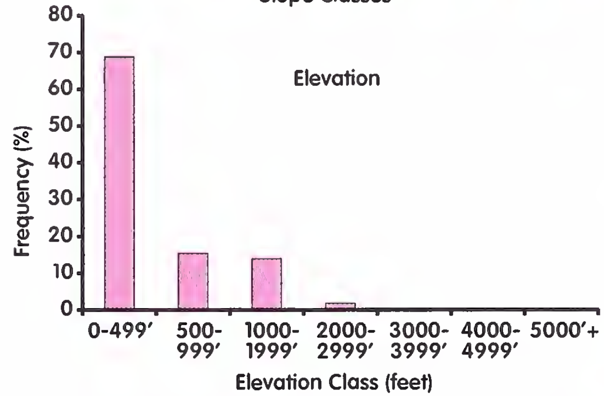
Land-Human Interactions. The Stikine and Taku Rivers were the original homes of the Stikine and Taku Tlingits, respectively. A number of Native settlements, fish camps, gardens, and smokehouses were located along these rivers. During the summer, these valleys provided Natives with rich living conditions through abundant salmon runs, aquatic mammals (muskrat, beaver, mink, porcupine), and berry patches. These river systems were important travel and trade corridors for Natives and later prospectors during the Cassiar Gold Rush (1860s–70s). The Stikine River is still used for travel and commerce as far as Telegraph Creek, British Columbia. These rivers support important Canadian fisheries. In the United States, most of the area is managed as natural settings and wilderness. Very little is privately owned and no timber harvest or roads are present. Both valleys are used extensively for moose and duck hunting and other recreational activities. Local air and boat charters allow visitors access to the scenic beauty. Recreationists floating down the Stikine River frequently visit Chief Shakes Hot Springs along Ketili Slough.

A view of the Stikine River looking upriver (northeast) from near the mouth of Shakes Slough. Ketili Slough can be seen on the left as it parallels the river. Barnes Lake is visible in the distance. Extensive wetlands have formed in the valley bottom, whereas river islands are mostly covered with cottonwood, alder, and brush.

Stikine-Taku River Valleys	Ranked Order					% GRID reporting data
	1st	2nd	3rd	4th	5th	
Landforms	Mountain Slopes (36%)	Valley Floor (23%)	Lowlands (18%)	Mountain Summits (16%)	Hills (6%)	72
Parent Materials	Residuum (32%)	Alluvial (22%)	Colluvium (16%)	Organic Material (11%)	Bedrock (10%)	71
Soils	Spodosols (33%)	Entisols (23%)	Histosols (23%)	Inceptisols (17%)	Miscellaneous (3%)	72
Landcover	Brush (30%)	Hemlock-Spruce (15%)	Hemlock (15%)	Landslides (10%)	Poplar (8%)	100
Productivity	Productive Forests (46%)	Nonforested (39%)	Nonproductive Forests (15%)			100
Site Index	SI 0-40 (52%)	SI 61-80 (21%)	SI 41-60 (20%)	SI >80 (7%)		100
Wetlands	Upland (68%)	Riverine (13%)	Palustrine Emergent (10%)	Palustrine Scrub-Shrub (6%)	Lacustrine Limnetic (1%)	90
Stream Process Groups	Palustrine (27%)	High Gradient-Contained (26%)	Glacial Outwash (26%)	Floodplain (10%)	Alluvial Fan (4%)	
Land Use Designations	Mostly Natural Setting (58%)	Wilderness & Monument (39%)	Private (3%)			100







Deltas

Long periods of sediment deposition at the mouths of large rivers form *deltas*. Due to dynamic river processes, these surfaces often develop fan shapes as they build. *Deltas* benefit from the aerial transfer of silts and fine sands by strong downriver winds during low water flows *(aeolian* or *loess* deposition). In Southeast Alaska, these landscapes are rare since few rivers are large enough to form *deltas*. Moreover, the deep narrow *fjords* into which most rivers empty impede *delta* development. These deep *fjords* fill slowly and containerize sediments to form narrow valley floor extensions (e.g., Taku, Unuk, and Chickamin Rivers) rather than broad fan-shaped *deltas*. The only well-developed *delta* in Southeast Alaska occurs at the mouth of the Stikine River.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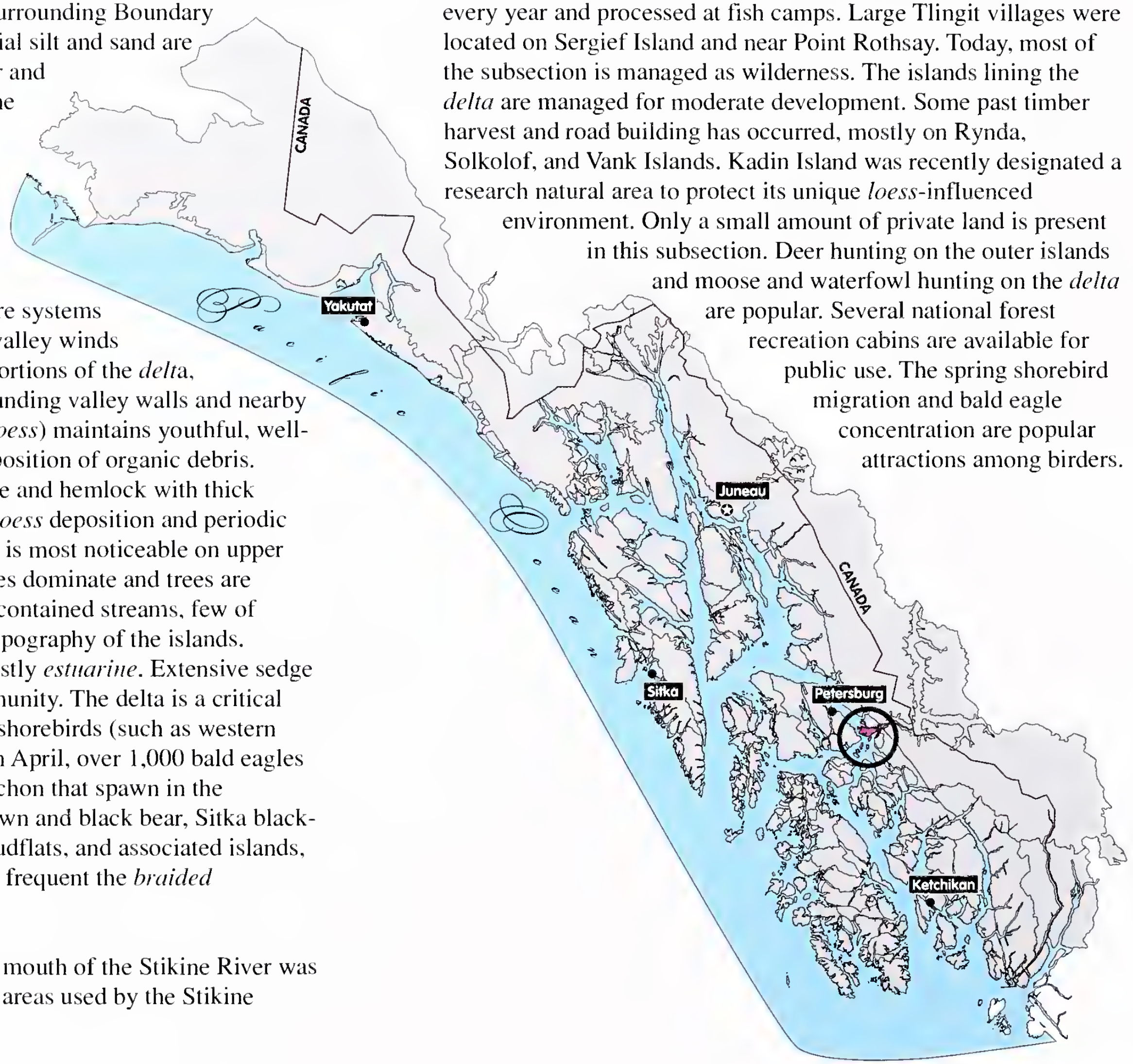
Stikine River Delta

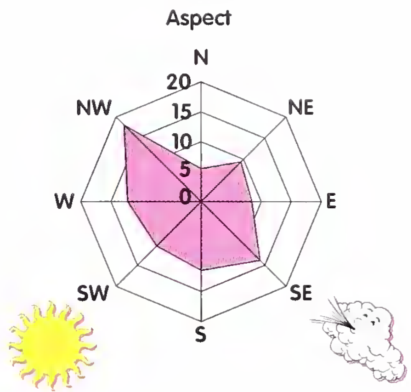
Although local precipitation is moderately high, this subsection is most affected by runoff from streams in the surrounding Boundary Ranges Icefields. Huge amounts of glacial silt and sand are carried by streams into the Stikine River and deposited onto a *delta* at the mouth of the river. At low tide, mudflats extend for many miles to the surrounding nearby islands in Sumner Strait and Frederick Sound. River flow is highest in summer, a result of snow and ice melt. In winter, river levels drop and expose portions of the *delta*. When high-pressure systems dominate the Canadian Interior, strong valley winds funnel down and blow across exposed portions of the *delta*, collecting and relocating silt onto surrounding valley walls and nearby islands. This aerial relay of silt (called *loess*) maintains youthful, well-drained soil that promotes rapid decomposition of organic debris. Productive upland forests of Sitka spruce and hemlock with thick devil's club understories are a result of *loess* deposition and periodic disturbance by wind. The effect of wind is most noticeable on upper Farm Island where extensive brush slopes dominate and trees are restricted to more sheltered sites. Short contained streams, few of which support fish, dissect the rolling topography of the islands. Streams flowing across the *delta* are mostly *estuarine*. Extensive sedge flats dominate the upper intertidal community. The delta is a critical stopover for many species of migrating shorebirds (such as western sandpiper and Dunlin) and waterfowl. In April, over 1,000 bald eagles are attracted to the *delta* to feed on eulachon that spawn in the intertidal braids of the river. Moose, brown and black bear, Sitka black-tailed deer, and wolf patrol the *delta*, mudflats, and associated islands, whereas river otter, muskrat, and beaver frequent the *braided* freshwater channels.

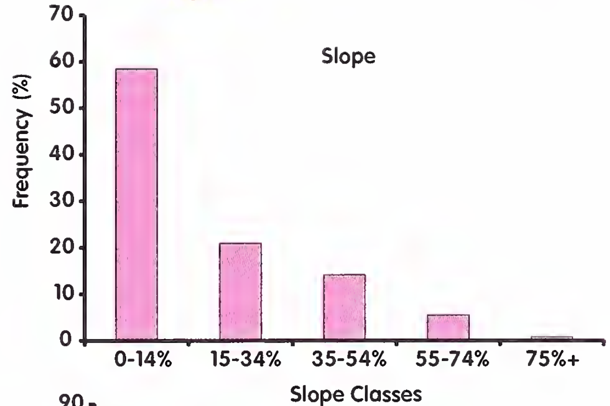
Land-Human Interactions: The mouth of the Stikine River was one of the most important fishing areas used by the Stikine Tlingits. Huge runs of salmon and eulachon were encountered every year and processed at fish camps. Large Tlingit villages were located on Sergief Island and near Point Rothsay. Today, most of the subsection is managed as wilderness. The islands lining the *delta* are managed for moderate development. Some past timber harvest and road building has occurred, mostly on Rynda, Solkolof, and Vank Islands. Kadin Island was recently designated a research natural area to protect its unique *loess*-influenced environment. Only a small amount of private land is present in this subsection. Deer hunting on the outer islands and moose and waterfowl hunting on the *delta* are popular. Several national forest recreation cabins are available for public use. The spring shorebird migration and bald eagle concentration are popular attractions among birders.

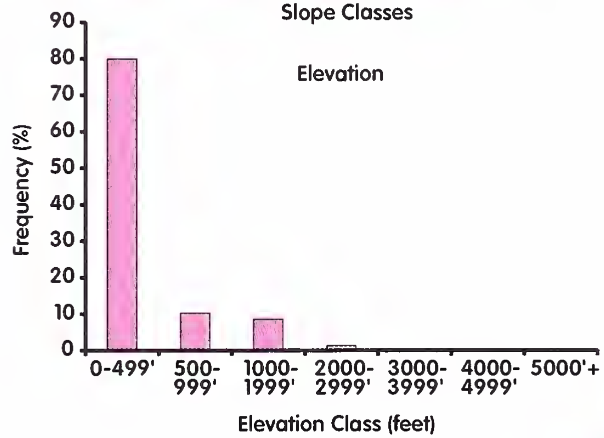


A view from over Vank Island looking northeast toward the mouth of the Stikine Delta. The most distant island in the photo is Sergief Island. At low tide, the delta is exposed past Sergief Island to encompass nearly all of Kadin Island, the larger island seen to the right of center. The delta and adjacent islands have loess soils, the result of receiving a light covering of wind-borne silt each winter.

Stikine River Delta	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Hills (44%)	Coastal (19%)	Mountain Slopes (18%)	Mountain Summits (8%)	Valley Floor (7%)	60
Parent Materials	Loess (43%)	Marine Beach (19%)	Residuum (14%)	Alluvial (7%)	Compact Till (5%)	60
Soils	Inceptisols (46%)	Entisols (19%)	Spodosols (16%)	Histosols (11%)	Miscellaneous (9%)	60
Landcover	Hemlock-Spruce (37%)	Brush (28%)	Hemlock (8%)	Spruce (8%)	Mixed Conifer (5%)	100
Productivity	Productive Forests (57%)	Nonforested (30%)	Nonproductive Forests (13%)			100
Site Index	SI 0-40 (38%)	SI 61-80 (28%)	SI >80 (26%)	SI 41-60 (8%)		100
Wetlands	Upland (71%)	Palustrine Emergent (11%)	Riverine (10%)	Estuarine Intertidal (4%)	Palustrine Scrub-Shrub (2%)	100
Stream Process Groups	Estuary (48%)	High Gradient-Contained (23%)	Palustrine (12%)	Floodplain (7%)	Moderate Gradient-Mixed Control (5%)	
Land Use Designations	Wilderness & Monument (70%)	Moderate Development (14%)	Mostly Natural Setting (13%)	Private (2%)		100

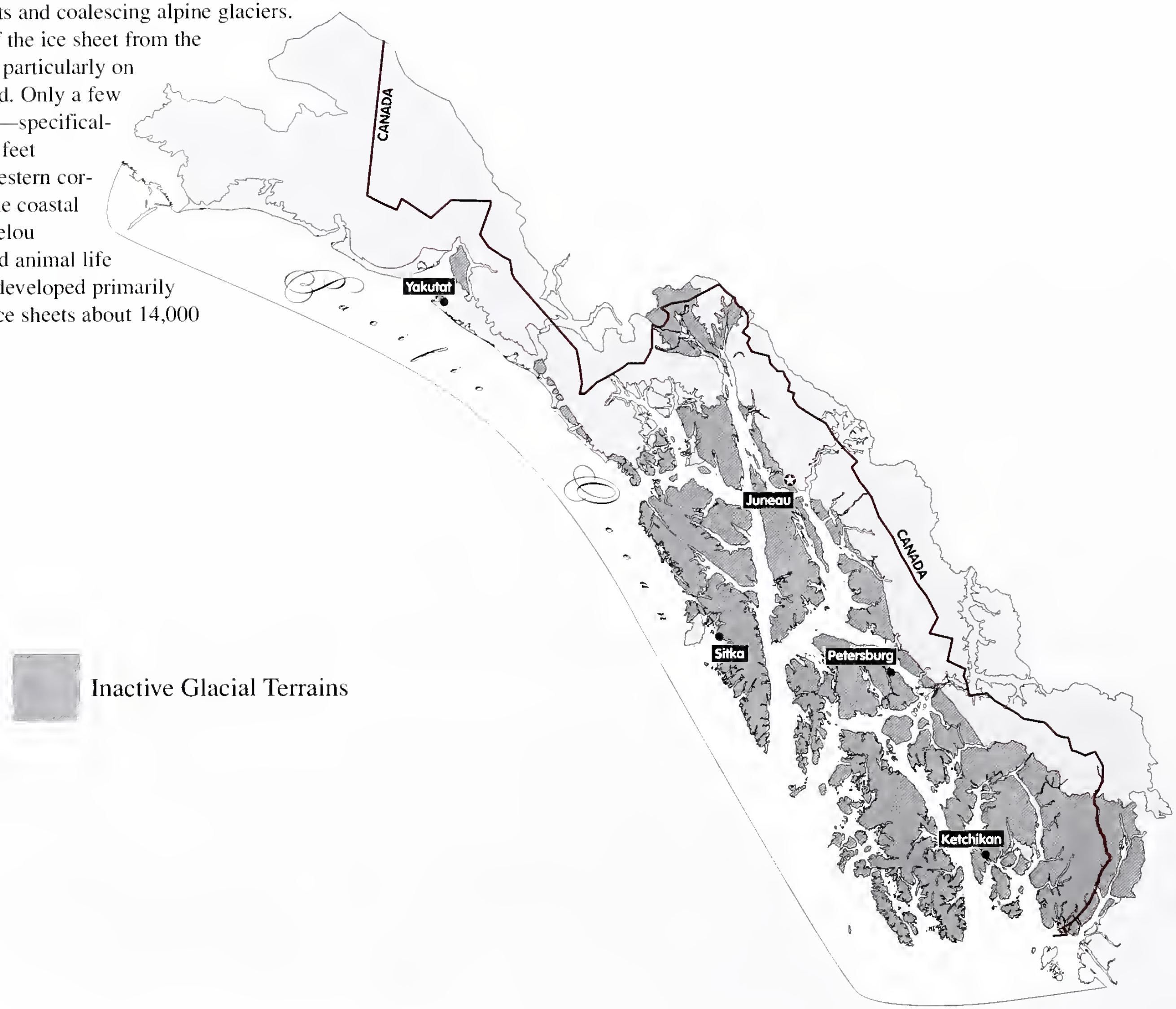




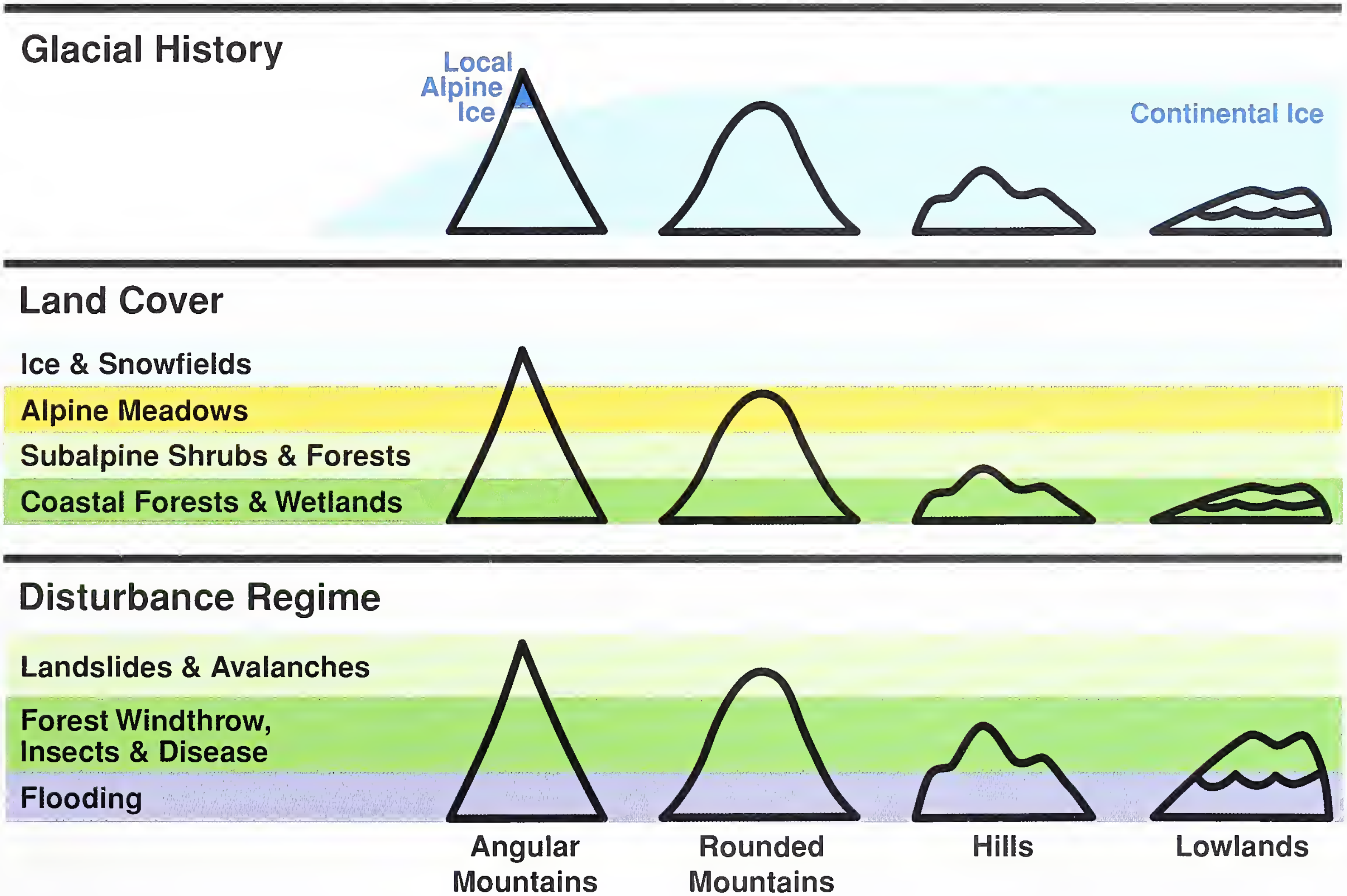


Inactive Glacial Terrains

The geomorphology of Southeast Alaska attests to a long history of glacial activity (Mann 1986). During the Pleistocene most of Southeast Alaska was covered by continental ice sheets and coalescing alpine glaciers. There was a general thinning of the ice sheet from the coastal mountains to the ocean, particularly on Prince of Wales Island westward. Only a few locales have escaped glaciation—specifically mountain peaks above 3,000 feet (1,600-2,000 feet in the southwestern corner of the archipelago) and some coastal areas facing the open ocean (Pielou 1991). The soils, vegetation, and animal life within these glaciated *terrains* developed primarily after the retreat of continental ice sheets about 14,000 years ago.



Ecological Differences among the Four Physiographic Classes within Inactive Glacial Terrains



These high mountains were not completely overridden by past continental ice sheets. Instead, alpine glaciers developed and contributed to the sharp, angular topography seen today. These small glaciers carved and sharpened mountain peaks (*horns*) and ridgelines (*arêtes*), forming steep concave slopes that enclose *cirque* basins and U-shaped valleys. Most of these craggy areas are located along the outer coast where there was a general thinning of continental ice. Many of the highest peaks were rocky exposures during the ice age (called *nunataks*), jutting above surrounding continental ice sheets. Today, within the *archipelago*, alpine glaciers and small icefields are mainly restricted to the high mountains of Baranof Island. Forest vegetation is largely restricted to coastlines and larger U-shaped valleys.

The topographic characteristics of angular mountains have significant ecological repercussions, which distinguish them from rounded mountains. The core difference is that steep and angular topography readily sloughs materials and sheds water. Because of this, angular mountains are often capped by bare rock and swept by landslides, debris torrents, and avalanches. Materials conveyed downslope by these disturbances form distinctive *alluvial* and *colluvial* piles that ring mountain bases. These disturbances have dramatic effects on landcover as well, riddling forested slopes with tongues of *talus* and brushfields and giving a ragged appearance to the land. Highly productive spruce-hemlock forests are concentrated on *alluvial* and *colluvial* toeslopes. Angular mountains tend to be better drained (either by steepness-driven runoff or coarse-substrate perculation) and possess fewer wetlands than rounded mountains. Compact and *ablation tills* are rather infrequent on angular mountains compared to rounded mountains.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These *plutonic* bodies are scattered across the *archipelago* and mainland. They were formed primarily when *allochthonous terranes* (such as island arc remnants of the Pacific Plate) collided into the North American continent. The force of these collisions formed large *magma* chambers at depth, which later cooled into coarse-grained rock. These rocks are gray in appearance and consist of well-developed mineral grains (quartz, feldspar, hornblende, and micas) that are generally large enough to see. Granitic rocks are resistant to erosion, prone to *exfoliation*, and often possess oversteepened slopes due to the carving action of glaciers. *Colluvial* materials often accumulate along the base of cliffs and steep slopes. The granular materials originating from granite weathering are prone to erosion and soils are often shallow, gravelly, and nutrient poor. Shallow, well-drained organic soils often develop over granitic bedrocks in gently sloping *terrain*. Due to soil infertility, vegetation tends to be less robust and scrubby, and low-productive forests are common. Alpine areas are especially species poor and sparsely vegetated. Except where faults or fractures occur, most granitic areas tend to be shallowly incised by streams due to their resistance to physical and chemical weathering. Granitic-based streams often have well-rounded *bedloads* and relatively low pH levels, alkalinity, and dissolved solute concentrations (Wissmar et al. 1997), resulting in lower primary production for aquatic biota.


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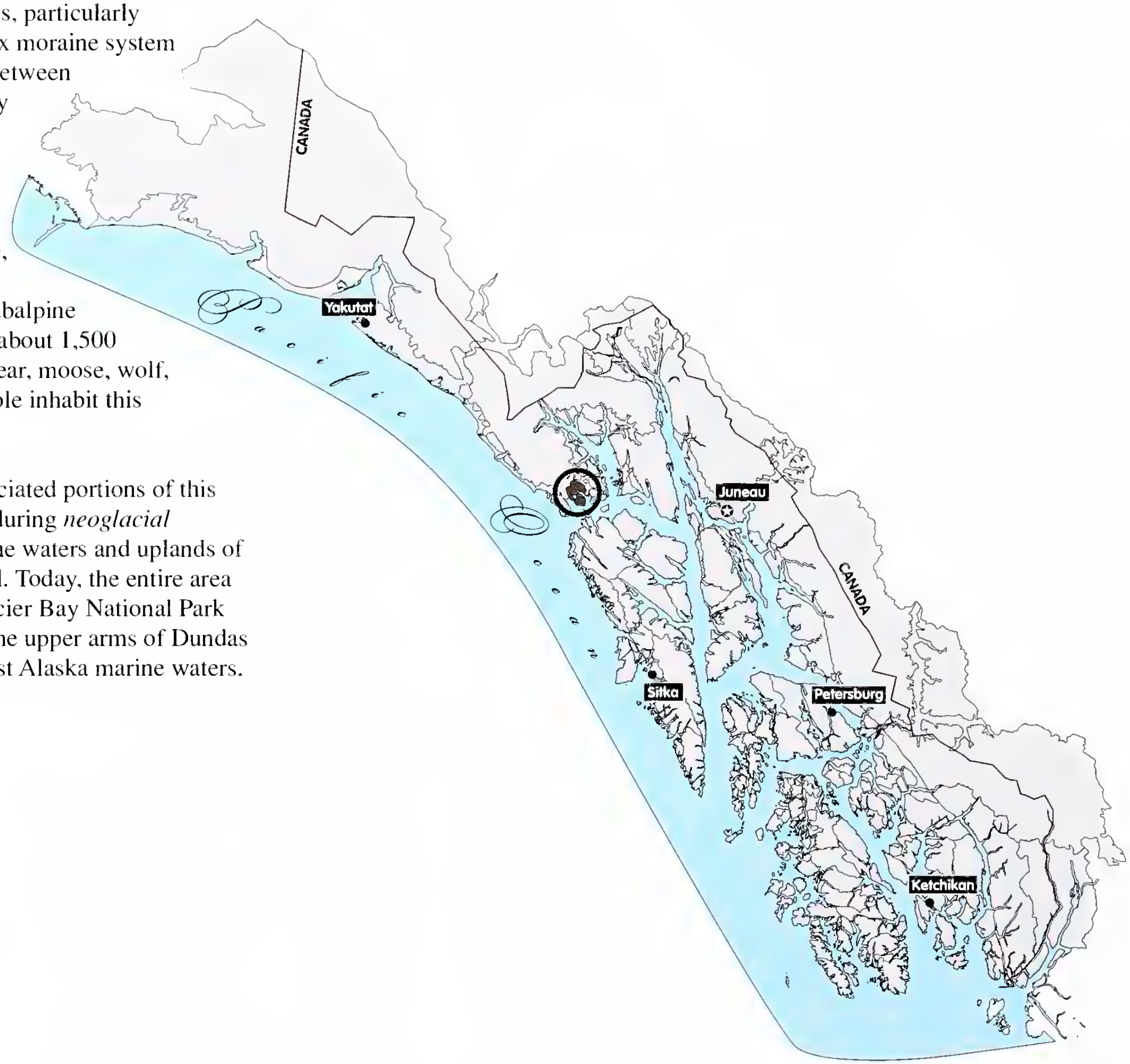
Dundas Bay Granitics

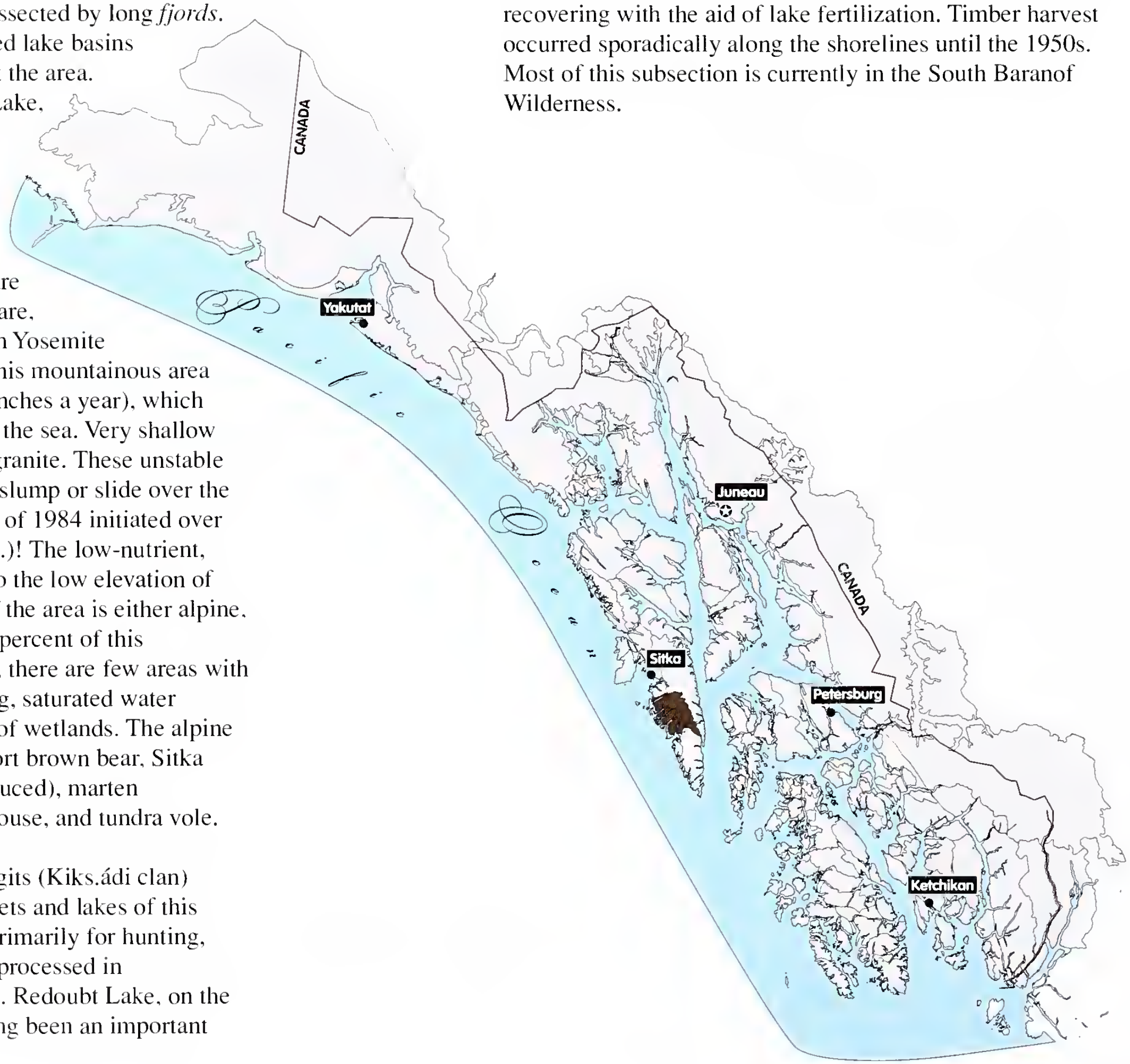
Highly dissected mountains curl around the upper branches of Dundas Bay. These fragmented mountains consist of granite and metamorphosed sediments and volcanics, particularly amphibolite and gneiss. A large complex moraine system forms a narrow strip of land (*isthmus*) between Taylor Bay and Dundas Bay bounded by bedrock on both sides. This rugged *terrain* was not overridden by *neoglacial* ice to any appreciable extent. The mountain slopes are covered with forests of hemlock, spruce, and yellow cedar. These forests become stunted and fragmented as they reach subalpine meadows and avalanche brush fields at about 1,500 feet. Mountain goat, black and brown bear, moose, wolf, wolverine, hoary marmot, and tundra vole inhabit this mountainous *terrain*.



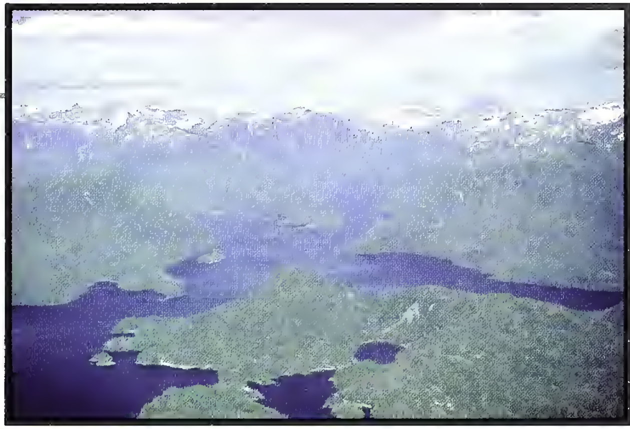
Land-Human Interactions. The unglaciated portions of this landscape provided refuge for humans during *neoglacial* periods. Hoonah Tlingits used the marine waters and uplands of this subsection prior to European arrival. Today, the entire area is designated wilderness within the Glacier Bay National Park and Preserve. Wilderness extends into the upper arms of Dundas Bay—a unique designation for Southeast Alaska marine waters.

The waters of Dundas Bay infuse a rugged set of granite-based mountains east of the Brady Glacier. These mountains, rising to 3,000 feet, are capped with alpine barrens and meadows and fringed by conifer forests. The steep slopes are dissected by avalanche and landslide chutes.

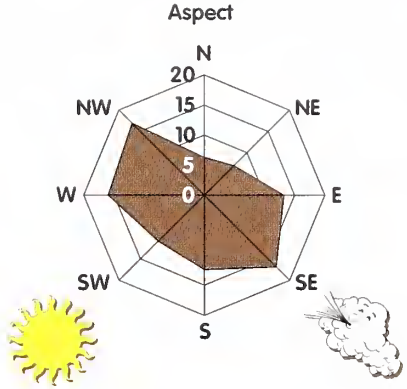
The west side of Baranof Island south of Sitka between Redoubt Lake and Whale Bay is stunningly picturesque. Here, the exposed granitic bedrocks are deeply dissected by long *fjords*. There are numerous large glacial-scoured lake basins occurring in *hanging valleys* throughout the area. One such lake near sea level, Redoubt Lake, has a saltwater lens underlying a freshwater cap. The intense scouring of alpine glaciation over the resistant granite has produced one of the most rugged topographies anywhere in Southeast Alaska. Many of the valleys are oversteepened and possess enormous, bare, *exfoliating* rock walls much like those in Yosemite National Park. Facing the open ocean, this mountainous area is deluged by rain and snow (over 180 inches a year), which feeds numerous cascades that plunge to the sea. Very shallow soils have developed over the resistant granite. These unstable soils become easily saturated and often slump or slide over the slick bedrock. One storm in late August of 1984 initiated over 100 landslides (S. Paustian, pers. comm.)! The low-nutrient, shallow soils and steepness contribute to the low elevation of tree line in this area. Over 50 percent of the area is either alpine, rock, brush, or landslides. Less than 15 percent of this subsection consists of wetlands. Indeed, there are few areas with slopes gentle enough to support standing, saturated water conditions needed for the development of wetlands. The alpine habitats fringed by coastal forests support brown bear, Sitka black-tailed deer, mountain goat (introduced), marten (introduced), common shrew, Keen's mouse, and tundra vole.



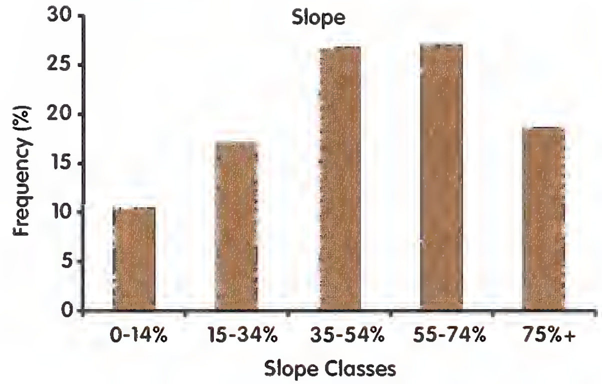
Land-Human Interactions. Sitka Tlingits (Kiks.ádi clan) originally traversed the steep-walled inlets and lakes of this rugged subsection. The area was used primarily for hunting, fishing, and berry gathering. Fish were processed in smokehouses scattered along shorelines. Redoubt Lake, on the northern edge of this subsection, has long been an important sockeye fishery for local people. The run, severely depleted by overharvest dating to Russian occupation, is now slowly recovering with the aid of lake fertilization. Timber harvest occurred sporadically along the shorelines until the 1950s. Most of this subsection is currently in the South Baranof Wilderness.

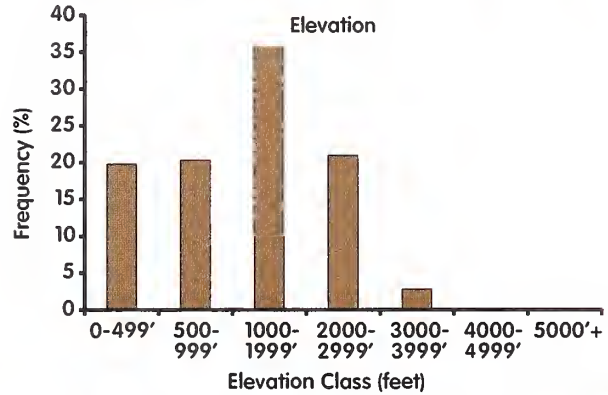


Looking northeast, Crawfish Inlet and Jamboree Bay (on the right) are framed by the Outer Coast Wave-cut Terraces in the foreground. The extremely steep nature of the Necker Bay Granitics is evident in the precipitous mountain slopes shown here. Last winter's snow is still common on the peaks when this picture was taken in July.



Necker Bay Granitics	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Summits (50%)	Mountain Slopes (34%)	Hills (9%)	Valley Floor (5%)	Lowlands (2%)	16
Parent Materials	Bedrock (55%)	Colluvium (20%)	Organic Material (19%)	Alluvial (3%)	Volcanic Ejecta (1%)	16
Soils	Histosols (34%)	Miscellaneous (26%)	Inceptisols (22%)	Spodosols (17%)	Entisols (1%)	16
Landcover	Alpine (24%)	Landslides (12%)	Hemlock (12%)	Rock (11%)	Brush (11%)	100
Productivity	Nonforested (42%)	Nonproductive Forests (35%)	Productive Forests (22%)			100
Site Index	SI 0-40 (83%)	SI 41-60 (12%)	SI 61-80 (3%)	SI >80 (2%)		65
Wetlands	Upland (84%)	Palustrine Forested (5%)	Palustrine Emergent (4%)	Lacustrine Limnetic (3%)	Palustrine Scrub-Shrub (2%)	100
Stream Process Groups	High Gradient-Contained (65%)	Lake (11%)	Alluvial Fan (7%)	Moderate Gradient-Mixed Control (6%)	Moderate Gradient-Contained (4%)	
Land Use Designations	Wilderness & Monument (82%)	Mostly Natural Setting (18%)				100





Noncarbonate rocks predominantly underlie these areas, including fine sandstones (*graywacke*) and mudstones with minor amounts of limestone and conglomerate. These rocks weather differently from most, producing semi-angular fragments that easily break down into their component particles. Many planes of weakness exist in the rock type due to processes of formation (layering of sediments into bedding planes and structural joints and faulting). Glacial scour and drainage networks often follow geologic structure and bedding orientation. A mixture of forest types occurs across the area as a function of drainage, aspect, and elevation. Soils reflect the original texture of the bedrock; for example, fine-textured soils result from siltstones and mudstones, and course-textured soils from sandstones.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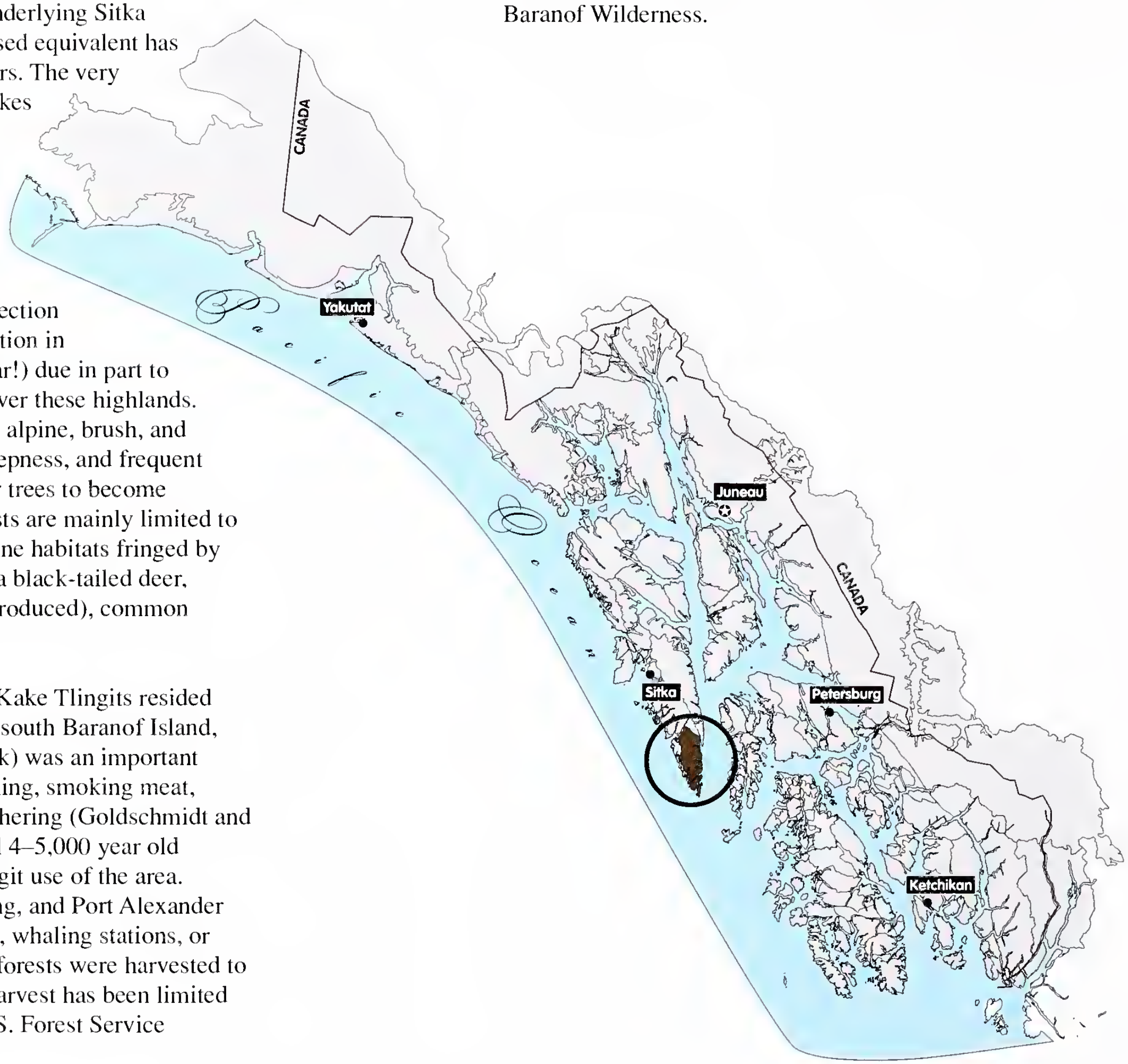
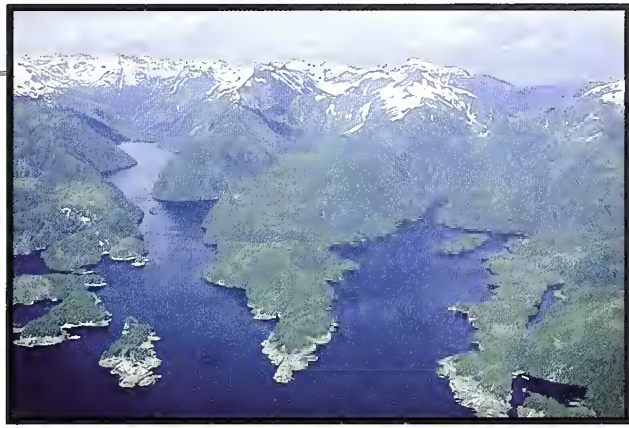
South Baranof Sediments

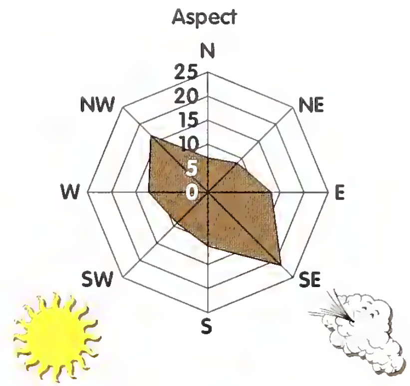
Towering mountains form the southern tip of Baranof Island from Whale Bay south, excluding the *Pleistocene* wave-cut terrace on the western side. Here, the underlying Sitka *graywacke* and its slightly metamorphosed equivalent has been intensely sculpted by alpine glaciers. The very steep terrain has numerous *fjords* and lakes perched in old glacial troughs. As with the Necker Bay Granitics and Central Baranof Metasediments to the north, this subsection possesses extremely rough topography. A dense network of *high gradient streams* follows the underlying bedrock structure. This subsection receives the highest amount of precipitation in Southeast Alaska (over 230 inches a year!) due in part to intense *orographic* lifting of moist air over these highlands. More than half of the area is covered by alpine, brush, and landslide tracks. The high elevation, steepness, and frequent avalanches make conditions difficult for trees to become established. Thus, hemlock-spruce forests are mainly limited to mountain bases and shorelines. The alpine habitats fringed by coastal forests support brown bear, Sitka black-tailed deer, mountain goat (introduced), marten (introduced), common shrew, Keen's mouse, and tundra vole.

Land-Human Interactions. Sitka and Kake Tlingits resided along the western and eastern shores of south Baranof Island, respectively. Redfish Bay (called Lanaak) was an important center of Native activities including fishing, smoking meat, hunting seal, fur trapping, and berry gathering (Goldschmidt and Hass 1998). Recent discovery of several 4–5,000 year old baskets attest to the long history of Tlingit use of the area. Redfish Bay, Port Walter, Port Armstrong, and Port Alexander all had thriving herring reduction plants, whaling stations, or canneries in the early 1900s. Shoreline forests were harvested to support these local industries. Timber harvest has been limited to personal use since the 1950s. The U.S. Forest Service manages this area for mostly natural settings and wilderness. The northern one-third of the area is within the South Baranof Wilderness.

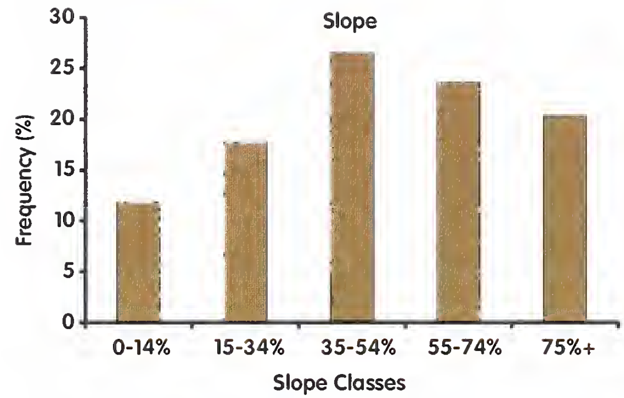


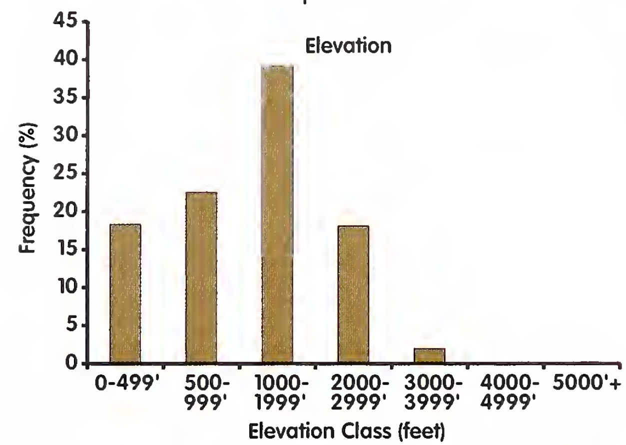


The majestic fjords of Big Branch Bay (left) and Little Branch Bay (right) as viewed from the south. The bare rocks along the outer edges of the bays attest to the severe storms that pound this coastline. The foreground is part of the Outer Coast Wave-cut Terraces, whereas the background is characteristic of this rugged and spectacular subsection.



South Baranof Sediments	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Summits (65%)	Mountain Slopes (24%)	Hills (8%)	Valley Floor (2%)	Coastal (1%)	65
Parent Materials	Bedrock (71%)	Colluvium (18%)	Organic Material (8%)	Alluvial (1%)	Glacial Till (1%)	63
Soils	Histosols (34%)	Inceptisols (28%)	Miscellaneous (27%)	Spodosols (9%)	Entisols (1%)	63
Landcover	Alpine (26%)	Brush (20%)	Hemlock-Spruce (13%)	Other (10%)	Landslides (9%)	100
Productivity	Nonforested (53%)	Nonproductive Forests (26%)	Productive Forests (21%)			100
Site Index	SI 0-40 (43%)	SI 41-60 (43%)	SI 61-80 (13%)	SI >80 (2%)		71
Wetlands	Upland (83%)	Palustrine Emergent (6%)	Lacustrine Limnetic (5%)	Palustrine Forested (4%)	Palustrine Scrub-Shrub (1%)	100
Stream Process Groups	High Gradient-Contained (63%)	Lake (14%)	Alluvial Fan (8%)	Moderate Gradient-Mixed Control (8%)	Floodplain (3%)	
Land Use Designations	Mostly Natural Setting (69%)	Wilderness & Monument (31%)				100





These high-relief *karstlands* occur in the northern portion of the Alexander *terrane* where originally horizontal carbonate beds have been upended. Here, bands of limestone and marble rocks lie within a matrix of mixed *lithologies*, often along ridges and mountaintops. Carbonate bedrocks are internally drained giving rise to well-drained soils of high productivity. Streams flowing across carbonate substrates tend to have channels that are bedrock controlled with scour pools and pockets filled by gravels recruited from glacial deposits in the area (Bryant et al. 1998). Streams originating on and within carbonate outcrops may be intermittent and seasonally dry. Water moves through porous bedrock via underground conduits. Rich calcareous fens often exist where these waters resurface. Overall, wetlands are infrequent and restricted to non-carbonate bedrock or glacial deposits. Shallow but fertile soils have developed from the weathering of carbonate rocks. The undulating *karst* topography is a product of the unique weathering processes whereby carbonate rocks actually dissolve rather than breakdown. As a result, these landscapes have large *dolines*, sinkholes, collapsed features, sinking and rising streams, and caves. Areas often show intense epikarst development—a matrix of bare rock interspersed with sparsely vegetated, thin soils. *Colluvial* deposits and *alluvial* fans along ridge flanks support highly productive forests of western hemlock and Sitka spruce. Past timber activity has concentrated on these productive lands (Baichtal and Swanston 1996). Because of their composition, carbonate rocks weather at a higher rate than most other rocks (Wissmar et al. 1997). Surface and subsurface waters often have high pH levels, alkalinity, and dissolved solute concentrations that enhance primary aquatic productivity (Wissmar et al. 1997). The unique water chemistry (high alkalinity and calcium) may be significant for the occurrence of various aquatic animals, including snails, mussels, sponges, and certain amphipods (Wissmar et al. 1997).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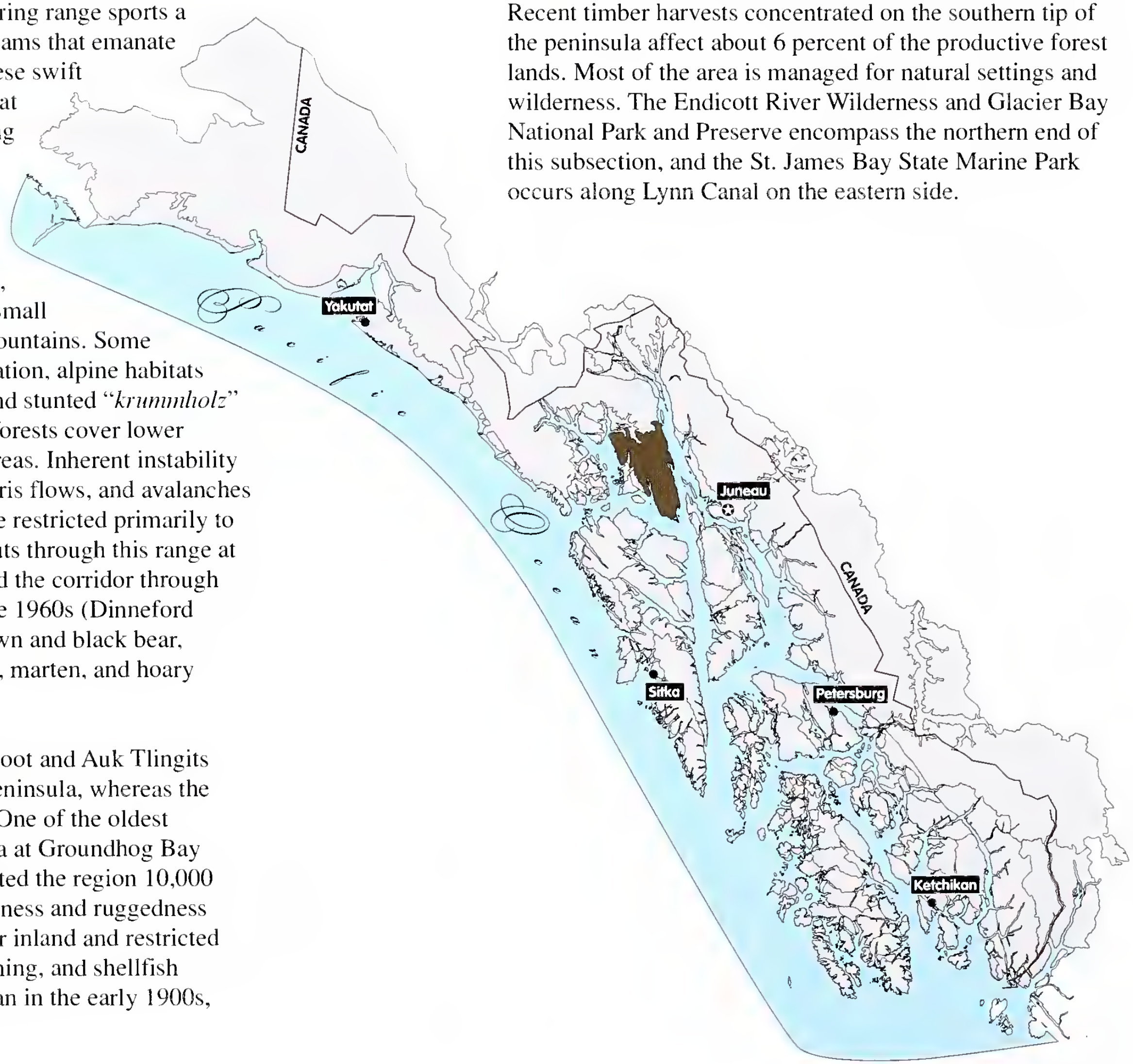
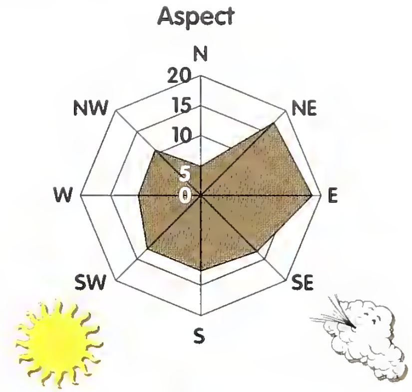
Chilkat Peninsula Carbonates

The rugged, snow-clad Chilkat Range branches south from the St. Elias Mountains to form a picturesque peninsula separating Lynn Canal and Glacier Bay. This towering range sports a dense network of incised rivers and streams that emanate from small glaciers and snowfields. These swift glacial streams carry heavy *bedloads* that form *deltaic* fans as they discharge along mountain bases. The lithology is comprised of a matrix of sedimentary rocks (sandstones) with numerous bands of carbonates. Because of its sheer height, alpine snowfields, barrens, and meadows cover much of the area. Small glaciers and icefields dot the highest mountains. Some *epikarst* is present as well. At mid-elevation, alpine habitats are replaced by subalpine shrublands and stunted "*krummholz*" forests. Hemlock and hemlock-spruce forests cover lower mountain slopes, valleys, and coastal areas. Inherent instability and snow loading cause landslides, debris flows, and avalanches in steep *terrain*. Infrequent wetlands are restricted primarily to coastal lowlands. The Endicott River cuts through this range at its northern end, and may have provided the corridor through which moose entered Glacier Bay in the 1960s (Dinneford 1990). Common mammals include brown and black bear, mountain goat, moose, wolf, wolverine, marten, and hoary marmot.

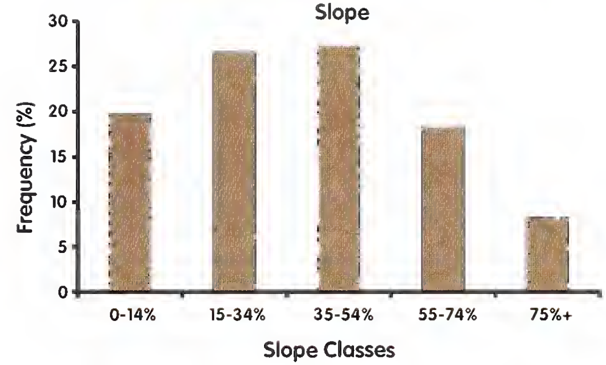


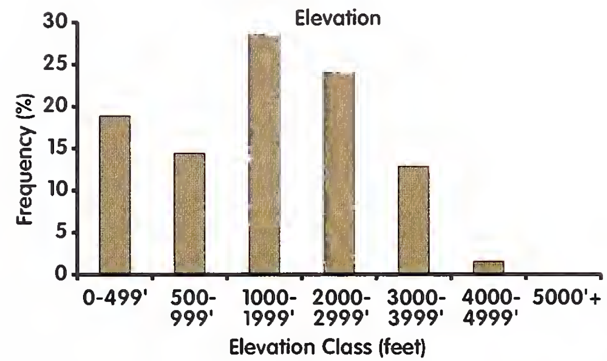
Land-Human Interactions. The Chilkoot and Auk Tlingits inhabited the east side of the Chilkat Peninsula, whereas the Hoonah Tlingits used its western side. One of the oldest archaeological sites in Southeast Alaska at Groundhog Bay indicates that a maritime culture inhabited the region 10,000 years ago (Ackerman 1968). The steepness and ruggedness prevented the Natives from traveling far inland and restricted their activities to shoreline hunting, fishing, and shellfish digging. Logging on the peninsula began in the early 1900s, providing lumber for a large cannery at Excursion Inlet and a copper mine works at William Henry Bay (Roppel 1991). Recent timber harvests concentrated on the southern tip of the peninsula affect about 6 percent of the productive forest lands. Most of the area is managed for natural settings and wilderness. The Endicott River Wilderness and Glacier Bay National Park and Preserve encompass the northern end of this subsection, and the St. James Bay State Marine Park occurs along Lynn Canal on the eastern side.

The angular profile of the Chilkat Range as it appears from the eastern shores of Glacier Bay. This rugged range forms the spine of the Chilkat Peninsula, harboring many icefields, glaciers, and permanent snowfields. Snow avalanches commonly sweep upper mountain slopes. Forests fringe shorelines and occupy larger valley bottoms.



Chilkat Peninsula Carbonates	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (43%)	Mountain Summits (31%)	Valley Floor (10%)	Lowlands (10%)	Hills (5%)	74
Parent Materials	Colluvium (29%)	Bedrock (26%)	Residuum (20%)	Organic Material (14%)	Alluvial (6%)	72
Soils	Spodosols (36%)	Miscellaneous (25%)	Histosols (16%)	Entisols (13%)	Inceptisols (10%)	72
Landcover	Alpine (41%)	Brush (14%)	Hemlock (14%)	Hemlock-Spruce (10%)	Lodgepole Pine (5%)	100
Productivity	Nonforested (54%)	Productive Forests (28%)	Nonproductive Forests (18%)			100
Site Index	SI 0-40 (61%)	SI 41-60 (21%)	SI 61-80 (11%)	SI >80 (7%)		100
Wetlands	Upland (87%)	Palustrine Forested (6%)	Palustrine Scrub-Shrub (4%)	Palustrine Emergent (2%)		100
Stream Process Groups	High Gradient-Contained (61%)	Moderate Gradient-Contained (8%)	Moderate Gradient-Mixed Control (7%)	Floodplain (7%)	Alluvial Fan (5%)	
Land Use Designations	Mostly Natural Setting (51%)	Wilderness & Monument (25%)	Moderate Development (13%)	Intensive Development (7%)	Private (3%)	100





Metasedimentary

Rock types underlying these areas are moderately to highly *deformed* and *metamorphosed* fine sandstone (*graywacke*), mudstone, volcanic rocks of basaltic and/or andesitic composition, and minor amounts of conglomerate and limestone. These have been *metamorphosed* to greenschist, greenstone, schist, phyllite, slate, quartzite, amphibolite, and marble. Glacial scour and drainage networks often reflect the geologic structure and bedding orientations. Soils reflect the original texture of the bedrock. For example, fine-textured soils result from greenstone and slate, whereas coarse-textured soils form from schists, amphibolite, and quartzite. Landslides often initiate along steep slopes at the soil-bedrock contact. A mixture of vegetation types exists across the area as a function of drainage, aspect, and elevation.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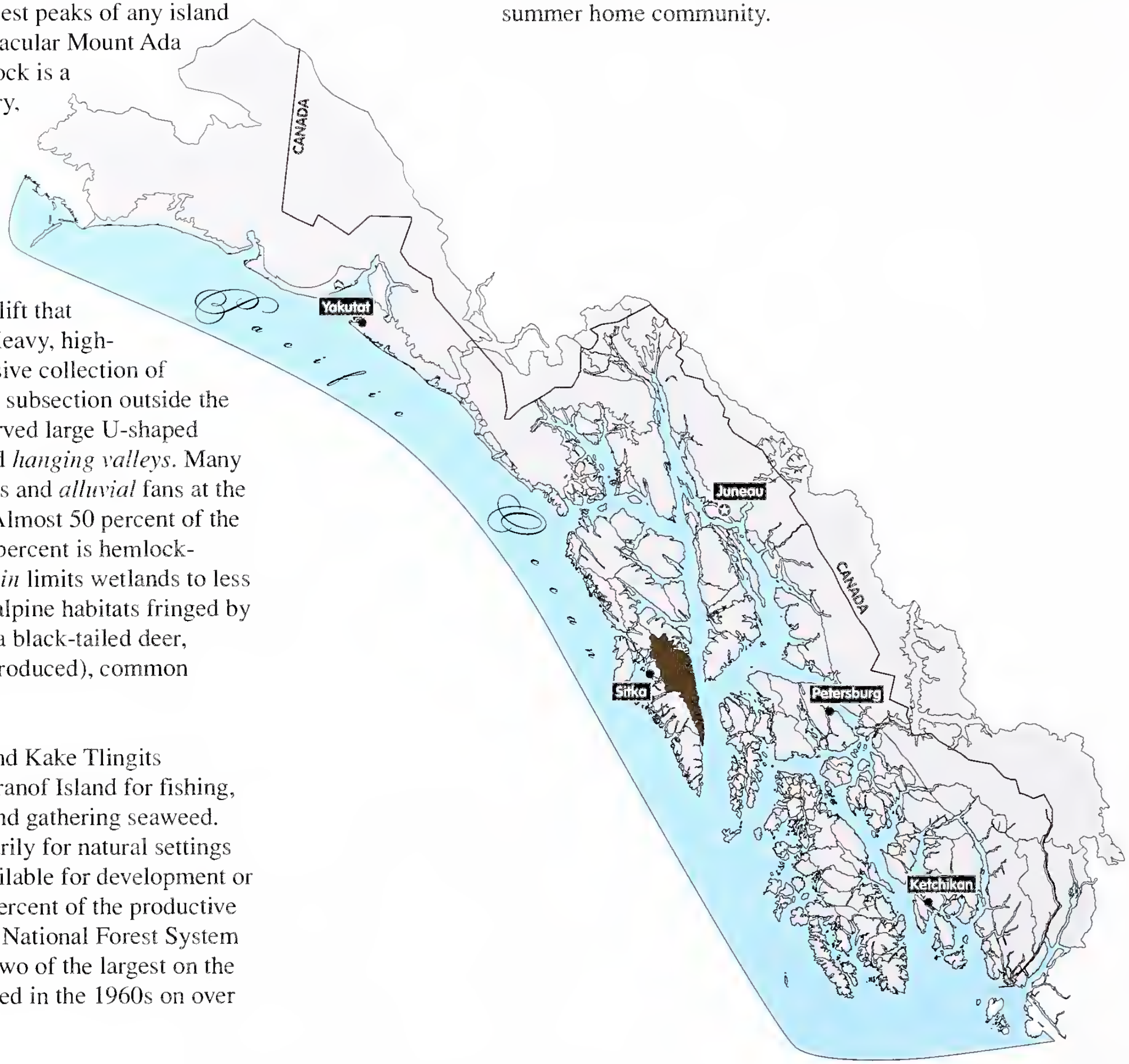
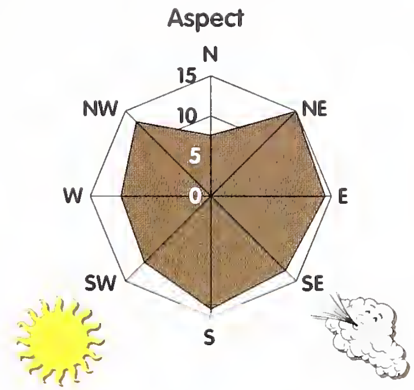
The central highland of Baranof Island is a place of extreme topography, weather, and beauty. When visible, the rugged *terrain* has stunning scenery and the tallest peaks of any island in Southeast Alaska, including the spectacular Mount Ada (cover photo) and Annahootz. The bedrock is a mixture of sedimentary, metasedimentary, and granitic rocks. It also has a notable ultramafic intrusion, by which Red Bluff Bay derives its name. This subsection has the highest topographic roughness in all of Southeast Alaska (see Appendix F). Abundant year-round precipitation is the result of *orographic* lift that strips clouds of moisture as they pass. Heavy, high-elevation snowfalls feed the most extensive collection of glaciers, icefields and snowfields of any subsection outside the mainland. Alpine glacial activity has carved large U-shaped valleys with precipitous valley walls and *hanging valleys*. Many sediment-laden streams form floodplains and *alluvial* fans at the bottom of the larger U-shaped valleys. Almost 50 percent of the subsection is alpine, and only about 10 percent is hemlock-spruce forest. The steepness of the *terrain* limits wetlands to less than 10 percent of this subsection. The alpine habitats fringed by coastal forests support brown bear, Sitka black-tailed deer, mountain goat (introduced), marten (introduced), common shrew, Keen's mouse, and tundra vole.

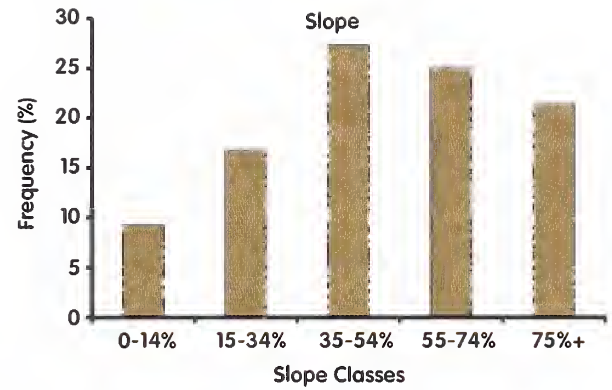
Land-Human Interactions. Angoon and Kake Tlingits originally used the eastern shores of Baranof Island for fishing, mink and otter trapping, seal hunting, and gathering seaweed. Today, the subsection is managed primarily for natural settings and wilderness. About 15 percent is available for development or is privately owned. Approximately 10 percent of the productive forest has been previously harvested on National Forest System lands. Nakwasina and Katlian Valleys, two of the largest on the west side of Baranof, were heavily logged in the 1960s on over 5,000 acres. Baranof Warm Springs, a thriving community of several thousand early in the 1900s, now is principally a summer home community.

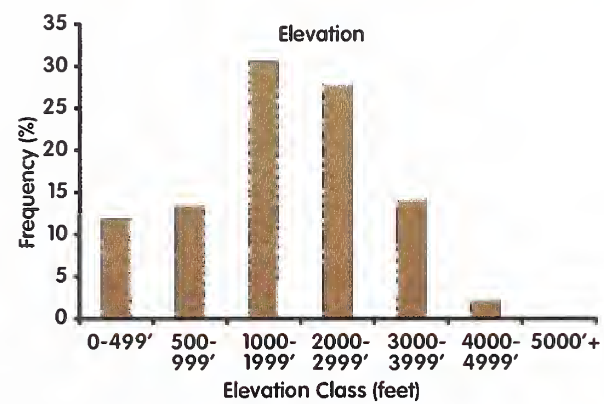


A rare view of the normally cloud-covered Cascade Bay area of eastern Baranof Island, taken from the northeast. The turquoise colored Carbon Lake attests to the high amount of glacial runoff into this watershed. The numerous glaciers are still cloaked in last winter's snow when this picture was taken in July. This photograph illustrates the extreme ruggedness of this subsection. With peaks of 4–5000 feet tall (background), this is the highest island area within the Alexander Archipelago.

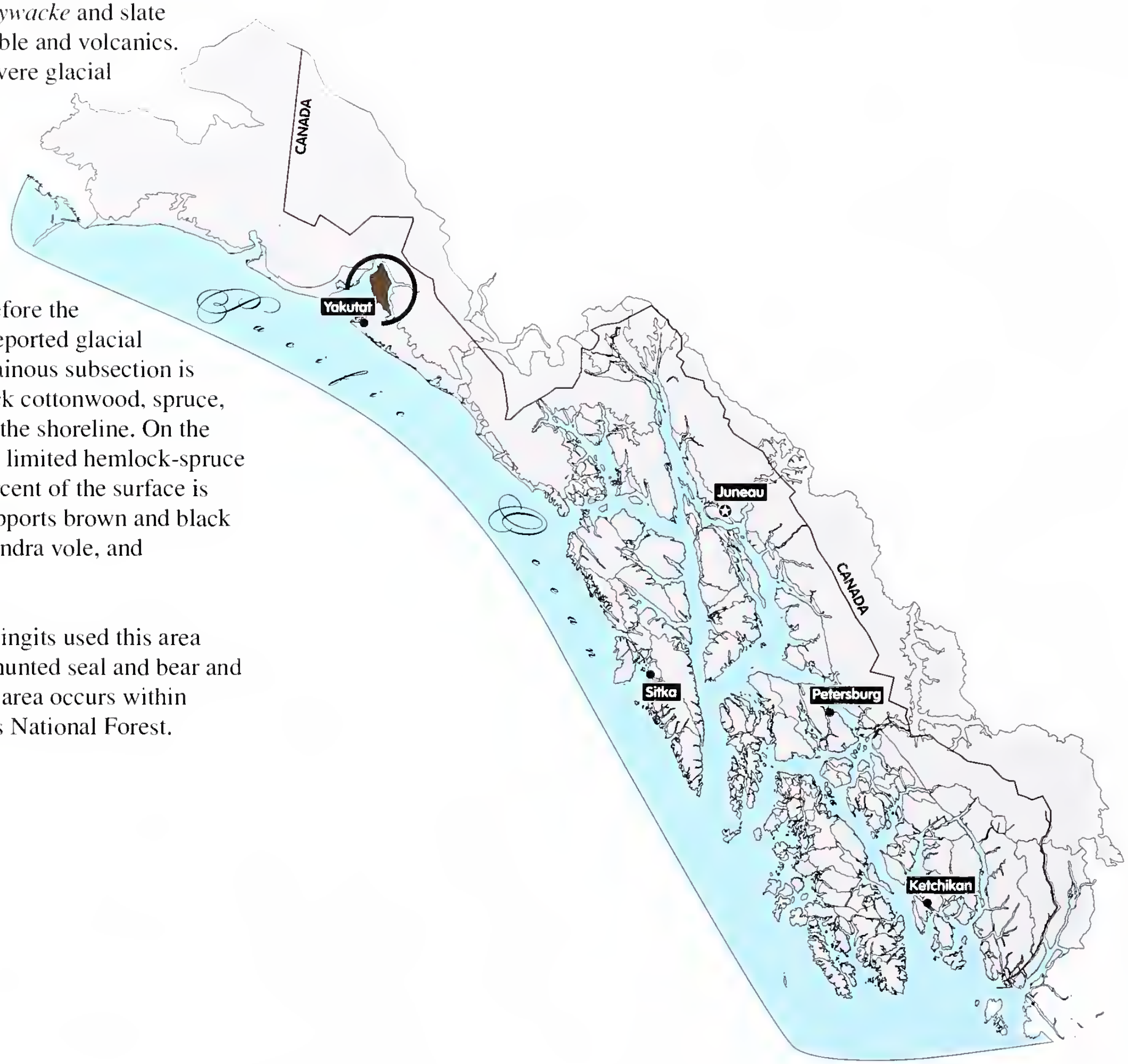
Central Baranof Metasediments	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Summits (56%)	Mountain Slopes (35%)	Valley Floor (6%)	Lowlands (2%)	Hills (1%)	78
Parent Materials	Bedrock (49%)	Colluvium (16%)	Residuum (14%)	Organic Material (7%)	Alluvial (5%)	78
Soils	Miscellaneous (48%)	Spodosols (27%)	Inceptisols (12%)	Entisols (7%)	Histosols (6%)	78
Landcover	Alpine (47%)	Hemlock-Spruce (11%)	Rock (10%)	Landslides (10%)	Other (8%)	100
Productivity	Nonforested (64%)	Nonproductive Forests (20%)	Productive Forests (15%)			100
Site Index	SI 0-40 (69%)	SI 41-60 (16%)	SI 61-80 (10%)	SI >80 (5%)		97
Wetlands	Upland (91%)	Palustrine Forested (3%)	Lacustrine Limnetic (2%)	Palustrine Emergent (2%)	Palustrine Scrub-Shrub (2%)	100
Stream Process Groups	High Gradient-Contained (62%)	Floodplain (8%)	Moderate Gradient-Mixed Control (8%)	Lake (8%)	Alluvial Fan (7%)	100
Land Use Designations	Mostly Natural Setting (65%)	Wilderness & Monument (20%)	Intensive Development (9%)	Private (3%)	Moderate Development (2%)	100





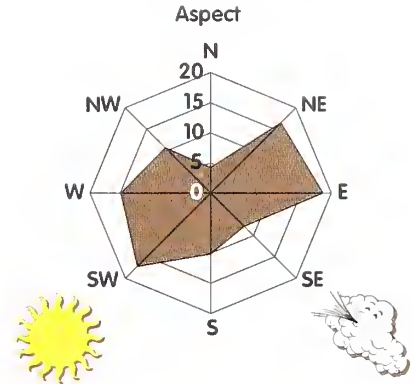


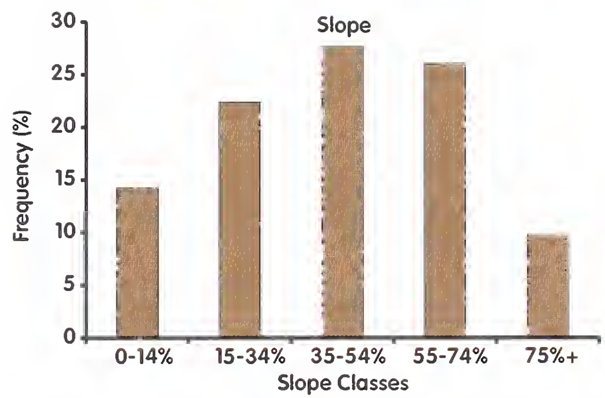
Yakutat Bay, Disenchantment Bay, and Russell Fiord encircle this mountainous peninsula northeast of Yakutat. The bedrock consists of slightly metamorphosed *graywacke* and slate interspersed with small amounts of marble and volcanics. Topography is very rough, reflecting severe glacial scouring over millennia. The Hubbard Glacier and the Nunatak Glacier have intermittantly dammed Russell Fiord, causing it to reverse flow and empty south down the Situk River. Most recently, in 1986, the Hubbard Glacier advanced across Osier Island, damming Russell Fiord. The water rose 85 feet before the ice dam broke, resulting in the largest reported glacial outburst flood. Very little of this mountainous subsection is forested. Sitka alder, with scattered black cottonwood, spruce, and mountain hemlock, are confined to the shoreline. On the Yakutat Bay side of the peninsula occur limited hemlock-spruce forests. Due to the steepness, only 3 percent of the surface is covered by wetlands. This peninsula supports brown and black bear, wolf, wolverine, hoary marmot, tundra vole, and ptarmigan.

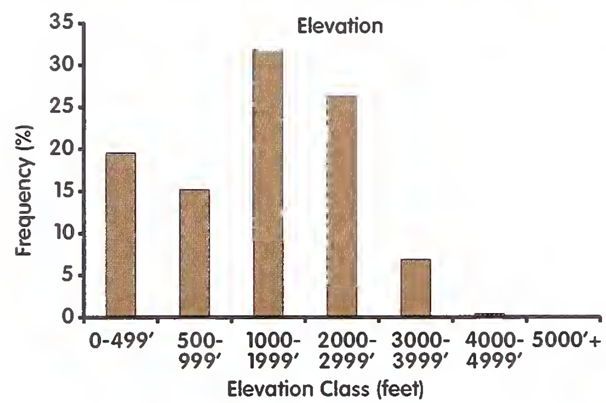


Land-Human Interactions. Yakutat Tlingits used this area mainly for subsistence. They regularly hunted seal and bear and gathered seagull eggs. Today, the entire area occurs within Russell Fiord Wilderness of the Tongass National Forest.

Russell Fiord and Puget Peninsula as viewed from the northwest. The alluvial fan in the center still contains many dead Sitka alder from when the Hubbard Glacier closed the mouth of Russell Fiord for five months in 1986. This photo was taken in 1993. Sitka alder brushfields dominate the slopes of Puget Peninsula with scattered cottonwood and spruce.







Puget Peninsula Metasediments	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms						0
Parent Materials						0
Soils						0
Landcover	Brush (35%)	Alpine (35%)	Rock (7%)	Landslides (6%)	Hemlock (4%)	100
Productivity	Nonforested (83%)	Productive Forests (12%)	Nonproductive Forests (4%)			100
Site Index	SI 0-40 (100%)					<1
Wetlands	Upland (97%)	Palustrine Scrub-Shrub (1%)	Estuarine Subtidal (1%)	Palustrine Forested (1%)		100
Stream Process Groups	High Gradient-Contained (79%)	Glacial Outwash (7%)	Moderate Gradient-Mixed Control (6%)	Alluvial Fan (4%)	Moderate Gradient-Contained (3%)	
Land Use Designations	Wilderness & Monument (100%)					100

Complex Sedimentary & Volcanics

These "complex" areas have a wide variety of *lithologies* composed principally of *undivided* sedimentary and volcanic rocks. Volcanic rocks of basaltic and andesitic composition are particularly common. Rocks include lava flows, *breccia, tuffs, graywacke* (a muddy sandstone), mudstone, carbonates (limestone), conglomerate, and the regionally *metamorphosed* equivalents of these strata. These rocks may be relatively undeformed to highly *deformed*. Glacial flow and drainage patterns tend to follow geologic structure and bedding, if present. Residual soils assume the original texture of the bedrock or parent material (e.g., fine-textured soils from mudstones). A mixture of forest types and plant communities exists across the area as a function of drainage, aspect, and elevation.

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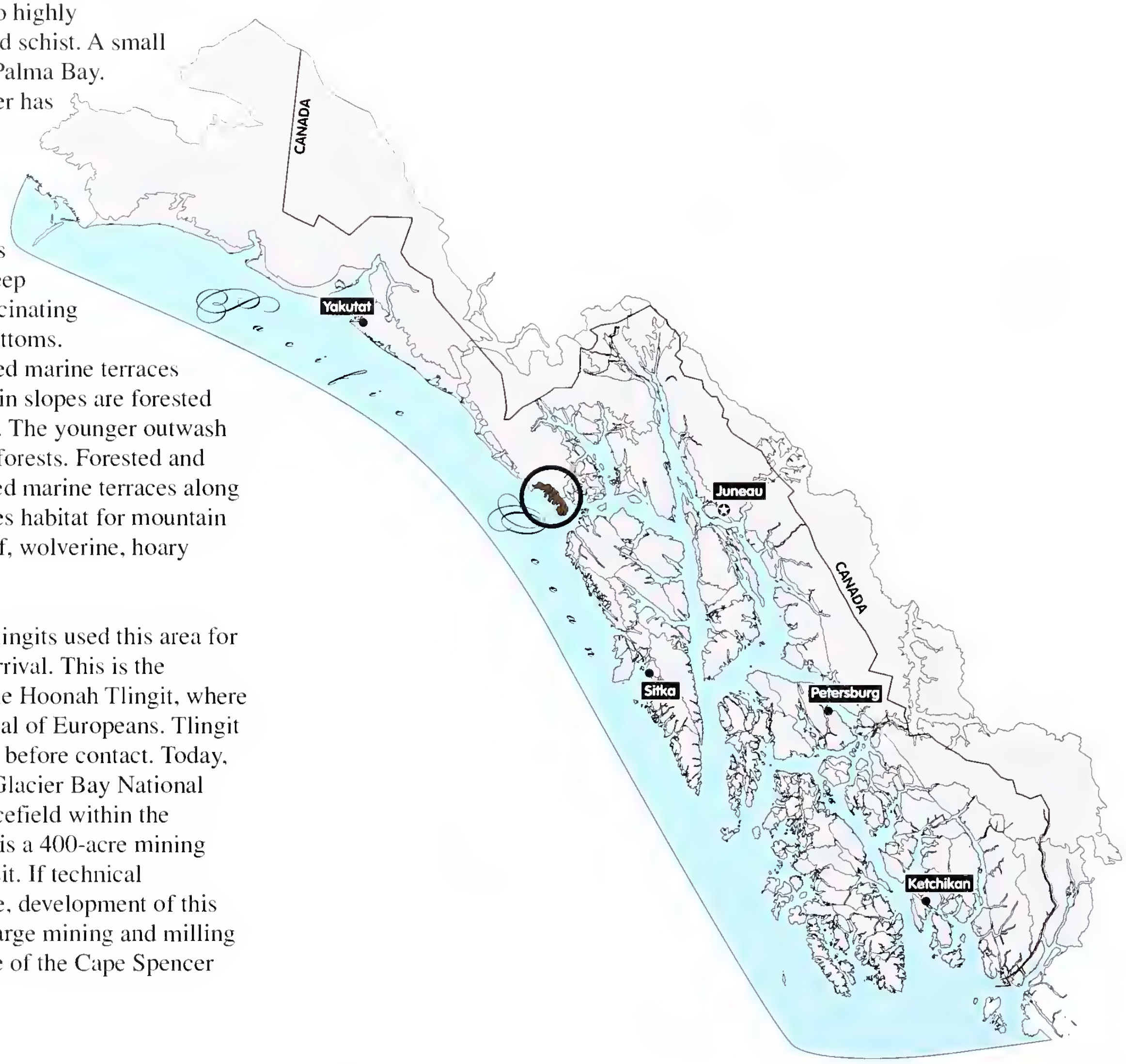
Ketchikan

Cape Spencer Complex

This highly dissected fjordland represents the southern extent of the Fairweather Range as it descends into Cross Sound. It is a rugged, ice-free *terrain* of moderately to highly metamorphosed rocks such as gneiss and schist. A small mafic/ultramafic body is intruded near Palma Bay. The close proximity of the Brady Glacier has profoundly influenced this area. At various times in the past, when the Brady Glacier extended out farther, outwash fans and ice-dammed lakes formed along its flanks. The interactions between the Brady Glacier and these steep coastal mountains have resulted in a fascinating array of glacial deposits in the valley bottoms. Additionally, there are a number of raised marine terraces along the outer coast. The outer mountain slopes are forested with hemlock, spruce, and yellow cedar. The younger outwash fans support mixed cottonwood-spruce forests. Forested and nonforested wetlands dominate the raised marine terraces along the coast. The diverse landscape provides habitat for mountain goat, brown and black bear, moose, wolf, wolverine, hoary marmot, and tundra vole.

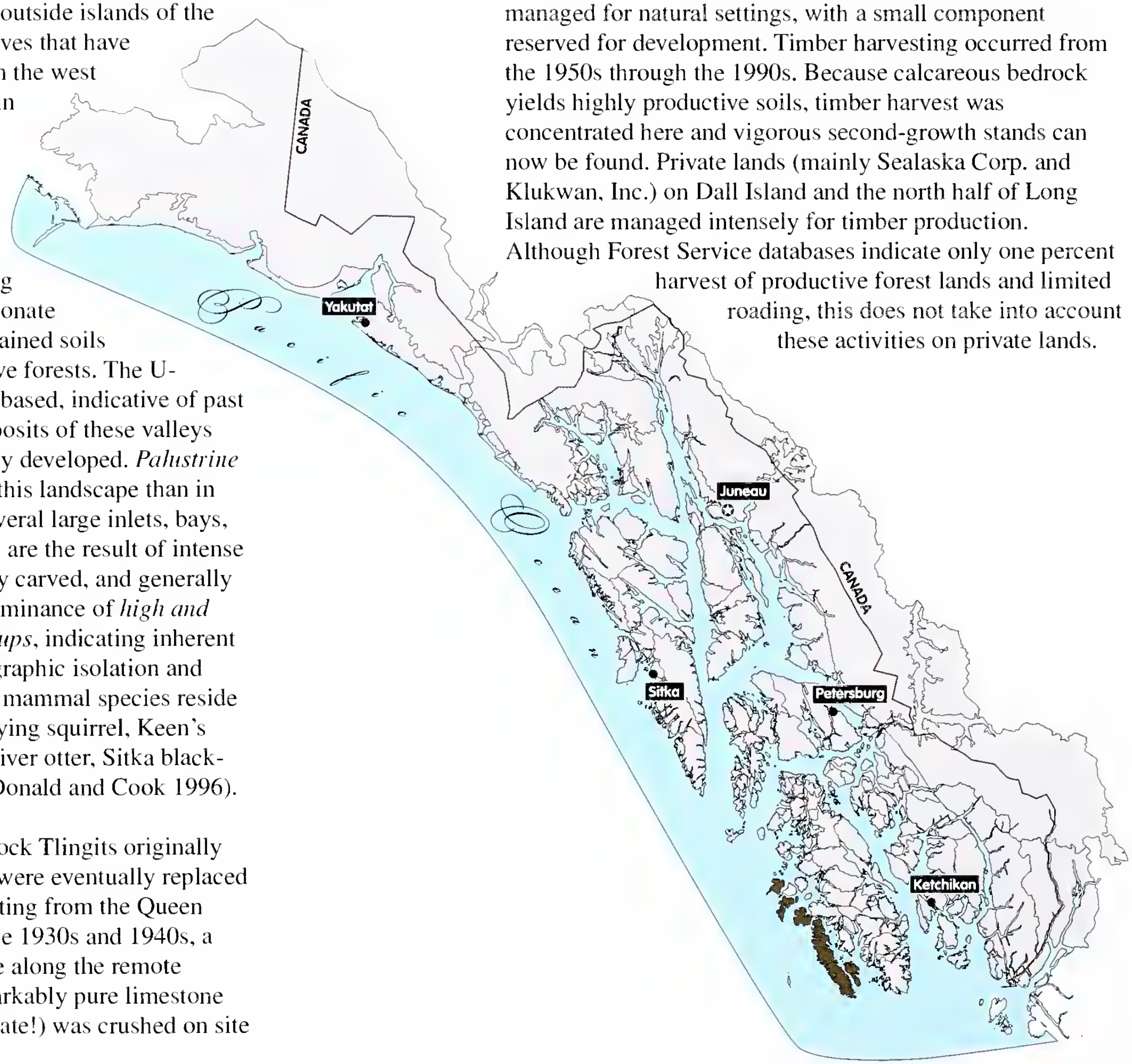


Land-Human Interactions. Hoonah Tlingits used this area for hunting and fishing prior to European arrival. This is the homeland of the T'akdeintaan clan of the Hoonah Tlingit, where several villages existed prior to the arrival of Europeans. Tlingit legends also make reference to this area before contact. Today, the area is in the wilderness portion of Glacier Bay National Park and Preserve. Beneath the Brady Icefield within the adjacent St. Elias-Fairweather Icefields is a 400-acre mining claim containing a substantial ore deposit. If technical engineering challenges can be overcome, development of this claim could result in construction of a large mining and milling operation at Dixon Harbor in the middle of the Cape Spencer Complex.

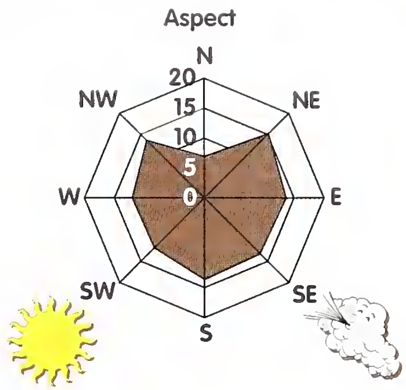
An even-spaced series of ridges and fjords line the Pacific Ocean just north of Cape Spencer. This repeating sequence is captured from Astrolabe Peninsula looking southeast across Dixon Harbor, Hankinson Peninsula, and beyond. Sugarloaf Island is at center right. Severe weather conditions rack this exposed area, helping restrict tree growth to shorelines and lower mountain slopes.

This subsection consists of a narrow, steeply rugged mountain range adjacent to the Gulf of Alaska and includes Noyes, Baker, Suemez, Dall, and Long Islands. These outside islands of the *archipelago* are pummeled by storm waves that have carved large bays, coves, and harbors on the west side. Severe and frequent storms result in moderately high precipitation. While reaching 2,500 feet, elevation is mostly less than 1,000 feet. The bedrock is mainly volcanics interspersed with carbonate rocks. The volcanic rocks are mantled by well-drained soils supporting moderately productive forests. The carbonate rocks are overlain with shallow, well-drained soils supporting moderate to highly productive forests. The U-shaped valleys are small, steep, and *till*-based, indicative of past alpine glaciation. It is on the glacial deposits of these valleys where forested wetlands have principally developed. *Palustrine emergent wetlands* are less common in this landscape than in other glacially modified landscapes. Several large inlets, bays, and coves on the east side of the islands are the result of intense alpine glacial scour. This steep, glacially carved, and generally well-drained landscape exhibits a predominance of *high and moderate contained stream process groups*, indicating inherent stability to perturbation. Due to its geographic isolation and distance to the mainland, relatively few mammal species reside here including dusky shrew, northern flying squirrel, Keen's mouse, long-tailed vole, ermine, wolf, river otter, Sitka black-tailed deer, black bear, and mink (MacDonald and Cook 1996).

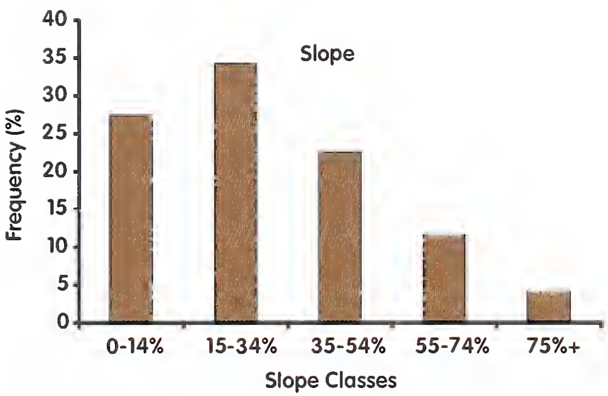
Land-Human Interactions. The Klawock Tlingits originally inhabited these outer coast islands, but were eventually replaced on Dall Island by Haida Indians emigrating from the Queen Charlotte Islands (Emmons 1991). In the 1930s and 1940s, a limestone quarry operated at View Cove along the remote eastern shore of Dall Island. Here, remarkably pure limestone (averaging 94.5 percent calcium carbonate!) was crushed on site and shipped to a cement manufacturing plant in Seattle, Washington (Roppel 1991). Today, most of this subsection is managed for natural settings, with a small component reserved for development. Timber harvesting occurred from the 1950s through the 1990s. Because calcareous bedrock yields highly productive soils, timber harvest was concentrated here and vigorous second-growth stands can now be found. Private lands (mainly Sealaska Corp. and Klukwan, Inc.) on Dall Island and the north half of Long Island are managed intensely for timber production. Although Forest Service databases indicate only one percent harvest of productive forest lands and limited roading, this does not take into account these activities on private lands.

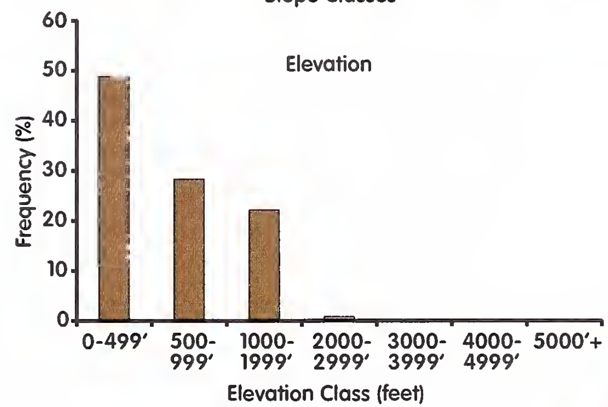


A rare view of the usually cloud-shrouded Dall Island from Grace Harbor looking northwest to Thunder Mountain. The alpine karst of Grace Mountain can be seen in the foreground. Thunder Mountain is the highest point just right of center with Baker Island in the distance. The photo was taken in the spring shortly after winter snowmelt.



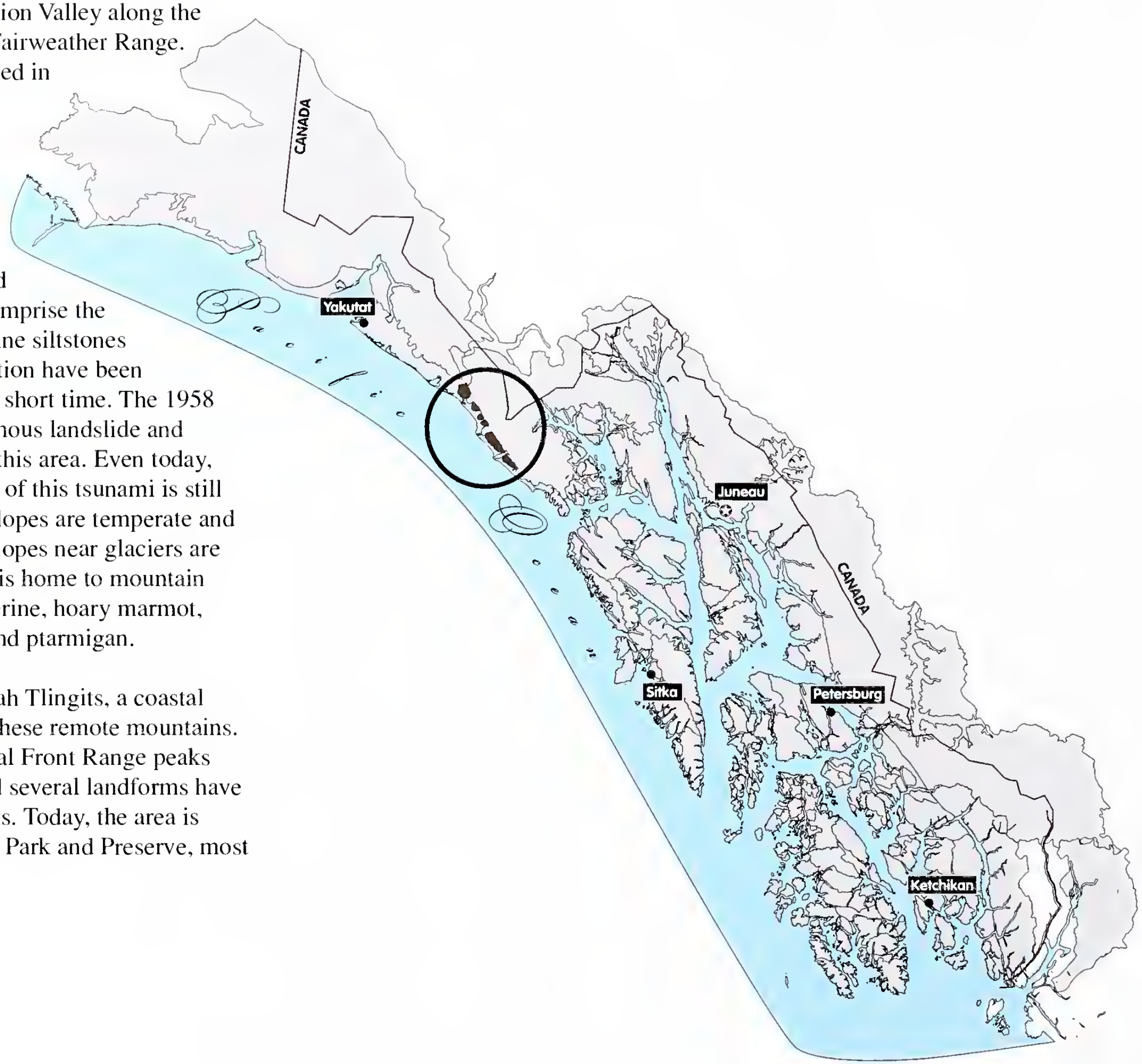
Dall-Outside Complex	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (73%)	Mountain Summits (8%)	Hills (8%)	Valley Floor (7%)	Coastal (4%)	69
Parent Materials	Colluvium (49%)	Organic Material (17%)	Residuum (15%)	Compact Till (11%)	Marine Beach (3%)	58
Soils	Spodosols (60%)	Histosols (28%)	Inceptisols (7%)	Miscellaneous (3%)	Entisols (2%)	69
Landcover	Hemlock (33%)	Brush (28%)	Mixed Conifer (12%)	Hemlock-Spruce (12%)	Lodgepole Pine (5%)	100
Productivity	Productive Forests (47%)	Nonforested (33%)	Nonproductive Forests (21%)			100
Site Index	SI >80 (46%)	SI 61-80 (23%)	SI 41-60 (22%)	SI 0-40 (9%)		98
Wetlands	Upland (76%)	Palustrine Forested (12%)	Palustrine Scrub-Shrub (6%)	Palustrine Emergent (3%)	Lacustrine Limnetic (1%)	99
Stream Process Groups	High Gradient-Contained (71%)	Moderate Gradient-Mixed Control (8%)	Moderate Gradient-Contained (7%)	Floodplain (5%)	Lake (4%)	
Land Use Designations	Mostly Natural Setting (63%)	Private (30%)	Moderate Development (5%)	Intensive Development (3%)		100





Fairweather Front Range Complex

This narrow mountain strip faces the Gulf of Alaska and is sandwiched between the Fairweather Range and the Yakutat-Lituya Forelands. The ice-filled Desolation Valley along the Fairweather fault separates it from the Fairweather Range. These fragmented mountains are breached in multiple locations by ice flowing from Desolation Valley onto the coastal forelands. This area, where the Pacific and North America plates make contact, is one of the most tectonically active areas of the world. Mildly metamorphosed volcanic *graywacke* and greenstone and associated rock types comprise the majority of these mountains. Some marine siltstones and sandstone from the Yakutaga formation have been uplifted thousands of feet in a relatively short time. The 1958 earthquake, which precipitated an enormous landslide and tsunami in Lituya Bay, was centered in this area. Even today, when flying over this area, the evidence of this tsunami is still easily seen. The ocean-facing western slopes are temperate and partially forested, whereas the eastern slopes near glaciers are cold and nonforested. The Front Range is home to mountain goat, brown and black bear, wolf, wolverine, hoary marmot, tundra vole, meadow jumping mouse, and ptarmigan.



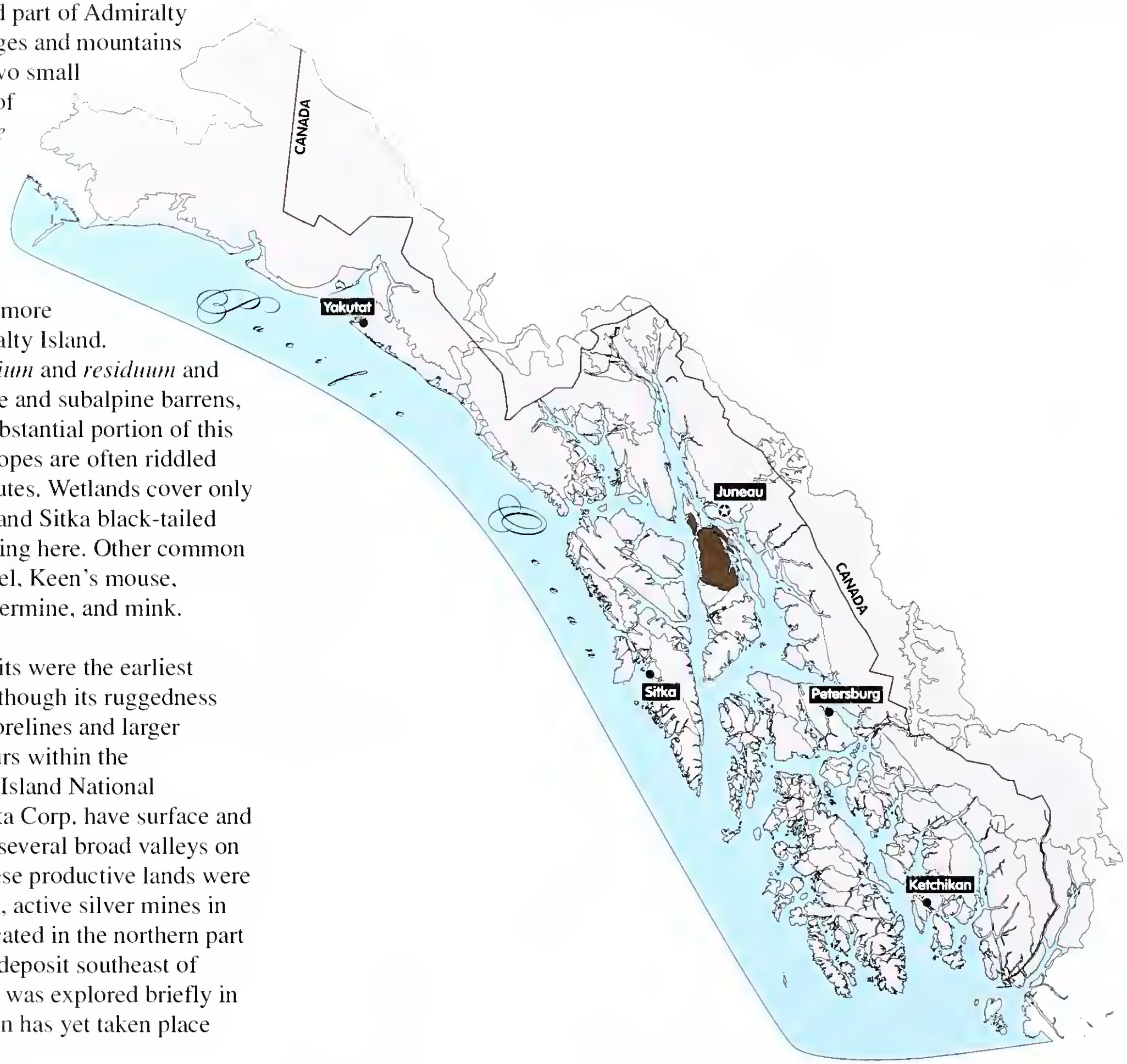
Land-Human Interactions. The Hoonah Tlingits, a coastal people, probably made minimal use of these remote mountains. Although unoccupied by humans, several Front Range peaks play prominently in Tlingit legends, and several landforms have been incorporated into Tlingit clan crests. Today, the area is located within the Glacier Bay National Park and Preserve, most of which is designated wilderness.

A set of coastal mountains north of Lituya Bay (front) separates coastal forelands (lower left) from the towering Fairweather Range (upper right). A deep ice-filled trench, called Desolation Valley, lies behind the Front Range, separating it from the St. Elias-Fairweather Icefields.

North Admiralty Complex

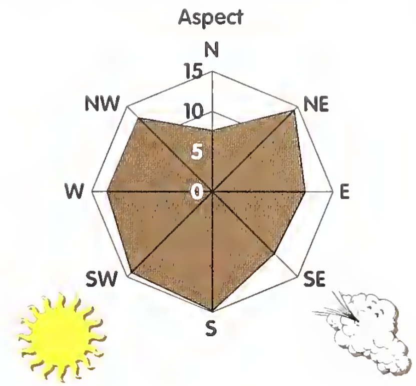
These highlands of north Admiralty Island are composed of an assortment of rock types of various ages. Metamorphic schistose rock is most common. This most rugged part of Admiralty Island consists of a series of narrow ridges and mountains separated by steep U-shaped valleys. Two small glacial remnants are located northwest of Hasselborg Lake. Uplifted *glaciomarine* sediments, part of the Stephens Passage Glaciomarine Terraces, rim most of the shorelines of this subsection. *High gradient and contained streams* spill across its steep, rough surface. *Alluvial* fans, located along mountain bases, are more common here than elsewhere on Admiralty Island. Parent material is predominantly *colluvium* and *residuum* and soils are often shallow and rocky. Alpine and subalpine barrens, meadows, and brushfields make up a substantial portion of this subsection. Forests draping the lower slopes are often riddled with brushy landslide and avalanche chutes. Wetlands cover only 10 percent of the land. The brown bear and Sitka black-tailed deer are the only large mammals occurring here. Other common animals include dusky shrew, red squirrel, Keen's mouse, meadow vole, long-tailed vole, marten, ermine, and mink.

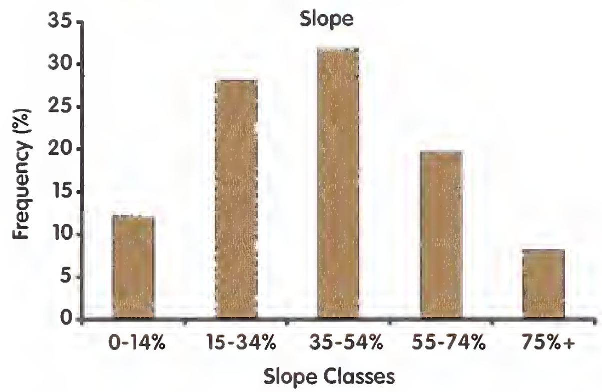
Land-Human Interactions. Auk Tlingits were the earliest known inhabitants of this subsection, although its ruggedness probably restricted their activities to shorelines and larger valleys. Presently, most of the area occurs within the Kootznoowoo Wilderness of Admiralty Island National Monument. Shee Atika Inc. and Sealaska Corp. have surface and subsurface ownerships, respectively, in several broad valleys on the west side. About 23,000 acres of these productive lands were clearcut in the 1990s. One of the largest, active silver mines in the world is the Greens Creek Mine, located in the northern part of this subsection. A nickel and copper deposit southeast of Funter Bay (known as the Mertie Lode) was explored briefly in the 1950s, but no commercial production has yet taken place (Roppel 1991). Visitors from around the world travel to Pack Creek to observe brown bear in their natural environs.

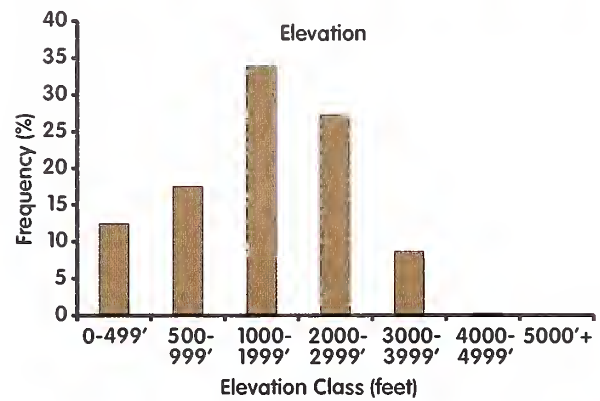


Robert Barren Peak, as an example of the North Admiralty Complex, and Funter Bay viewed from the northwest. The wetlands-rich Stephens Passage Glaciomarine Terraces are in the foreground, whereas the larger portion of the North Admiralty Complex lies in the background.

North Admiralty Complex	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (78%)	Valley Floor (11%)	Mountain Summits (7%)	Lowlands (3%)	Hills (1%)	14
Parent Materials	Residuum (47%)	Colluvium (24%)	Organic Material (11%)	Compact Till (10%)	Bedrock (6%)	14
Soils	Spodosols (67%)	Inceptisols (11%)	Histosols (11%)	Miscellaneous (6%)	Entisols (5%)	14
Landcover	Alpine (32%)	Hemlock (27%)	Hemlock-Spruce (20%)	Landslides (11%)	Other (2%)	100
Productivity	Productive Forests (48%)	Nonforested (31%)	Nonproductive Forests (22%)			100
Site Index	SI 0-40 (31%)	SI >80 (28%)	SI 41-60 (25%)	SI 61-80 (16%)		14
Wetlands	Upland (90%)	Palustrine Forested (5%)	Palustrine Emergent (3%)	Palustrine Scrub-Shrub (1%)	Lacustrine Limnetic (1%)	100
Stream Process Groups	High Gradient-Contained (77%)	Floodplain (7%)	Moderate Gradient-Mixed Control (6%)	Lake (3%)	Moderate Gradient-Contained (3%)	
Land Use Designations	Wilderness & Monument (84%)	Mostly Natural Setting (7%)	Private (7%)	Moderate Development (2%)		100

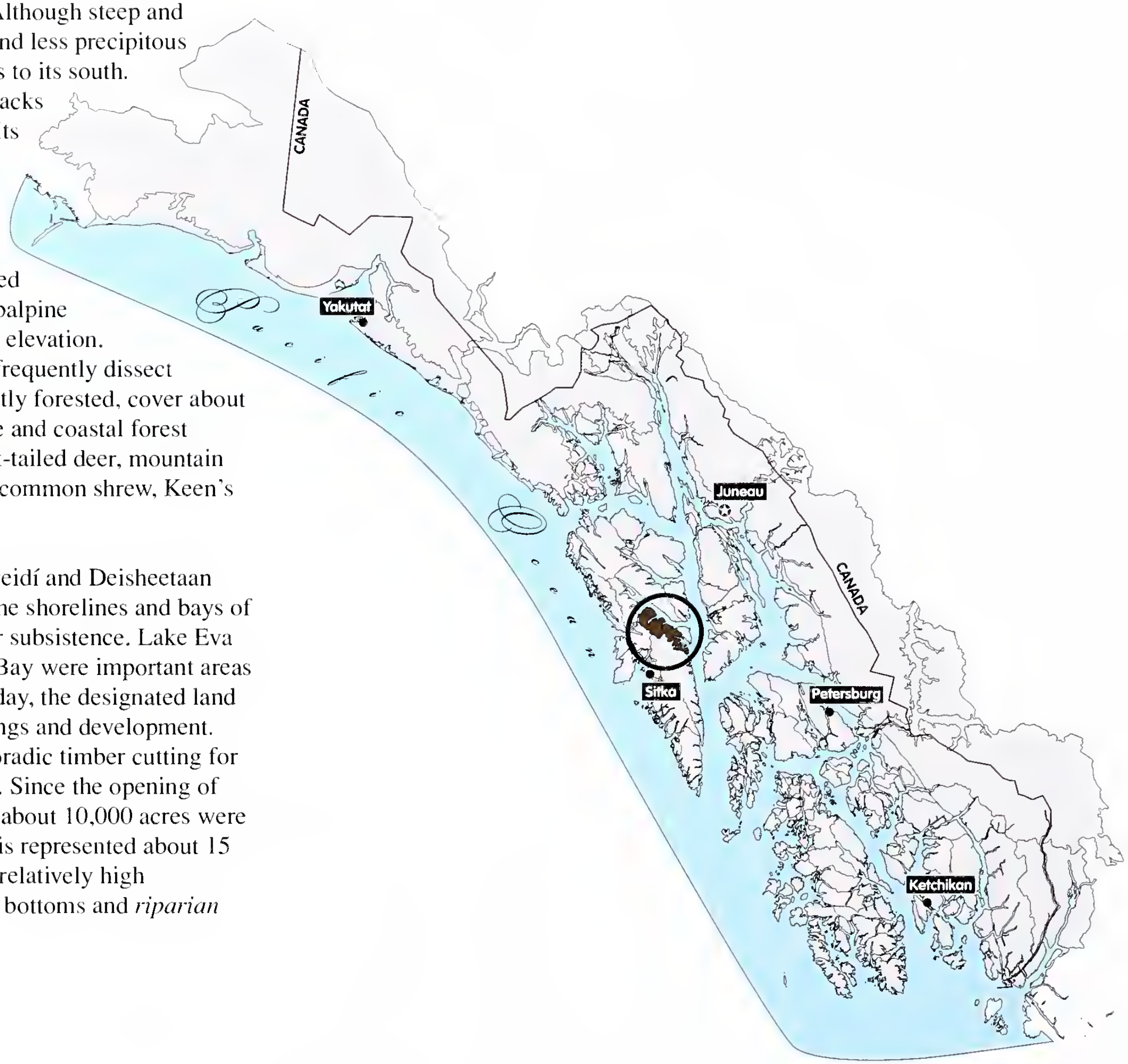






North Baranof Complex

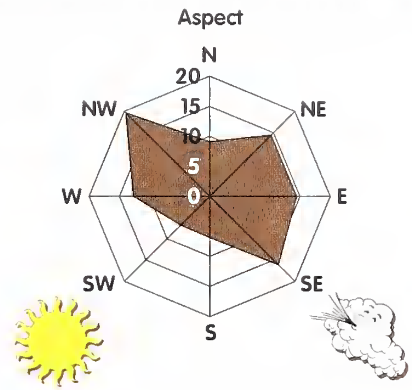
This northern portion of Baranof Island facing Peril Strait consists primarily of low-grade metamorphic rocks such as greenschist, greenstone, and phyllites. Although steep and rugged, the area is considerably lower and less precipitous than the Central Baranof Metasediments to its south. It has a few permanent snowfields, but lacks glaciers and icefields. Glacial *till* deposits are more abundant here than within any other subsection on Baranof Island. Hemlock-spruce forests cover a large portion of this subsection from shorelines to mid-slope positions. Stunted "*krummholz*" forests change to open subalpine and alpine communities with increasing elevation. Brushy landslide and avalanche chutes frequently dissect mountain slopes. Wetlands, predominantly forested, cover about 25 percent of the area. The mixed alpine and coastal forest habitats support brown bear, Sitka black-tailed deer, mountain goat (introduced), marten (introduced), common shrew, Keen's mouse, and tundra vole.

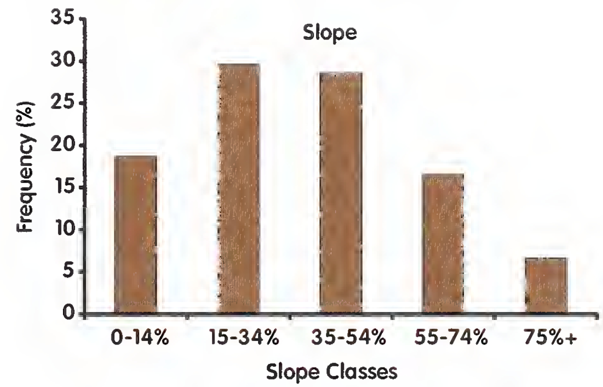


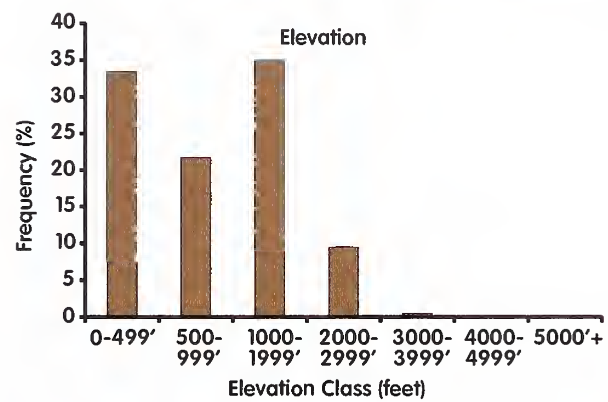
Land-Human Interactions. The Teikweidí and Deisheetaan clans of the Angoon Tlingits traversed the shorelines and bays of northeast Baranof Island, principally for subsistence. Lake Eva (a sockeye lake), Hanus Bay, and Kelp Bay were important areas for catching and processing salmon. Today, the designated land use is split between mostly natural settings and development. Located near Sitka, the area has had sporadic timber cutting for fuel and lumber for well over 150 years. Since the opening of the pulp mill in Sitka in the mid-1950s, about 10,000 acres were harvested before its closure in 1993. This represented about 15 percent of the productive forest land. A relatively high proportion of harvest occurred in valley bottoms and *riparian* zones during the 1960s and 1970s.

Annahootz Mountain in the background and the higher country of the North Baranof Complex as viewed from the northeast. Although still exhibiting steep characteristics, the mountains here are more subdued compared to the neighboring subsections to the south on Baranof Island.

North Baranof Complex	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (72%)	Valley Floor (10%)	Mountain Summits (9%)	Lowlands (6%)	Hills (3%)	99
Parent Materials	Residuum (41%)	Colluvium (23%)	Compact Till (11%)	Alluvial (9%)	Organic Material (8%)	99
Soils	Spodosols (68%)	Histosols (13%)	Inceptisols (11%)	Entisols (5%)	Miscellaneous (3%)	99
Landcover	Hemlock-Spruce (41%)	Other (15%)	Alpine (12%)	Landslides (8%)	Hemlock (7%)	100
Productivity	Productive Forests (52%)	Nonproductive Forests (30%)	Nonforested (18%)			100
Site Index	SI 0-40 (34%)	SI 61-80 (26%)	SI >80 (20%)	SI 41-60 (20%)		100
Wetlands	Upland (76%)	Palustrine Forested (14%)	Palustrine Emergent (7%)	Palustrine Scrub-Shrub (2%)	Estuarine Intertidal (1%)	100
Stream Process Groups	High Gradient-Contained (55%)	Floodplain (15%)	Moderate Gradient-Mixed Control (9%)	Alluvial Fan (8%)	Moderate Gradient-Contained (4%)	
Land Use Designations	Mostly Natural Setting (51%)	Intensive Development (46%)	Moderate Development (3%)			100

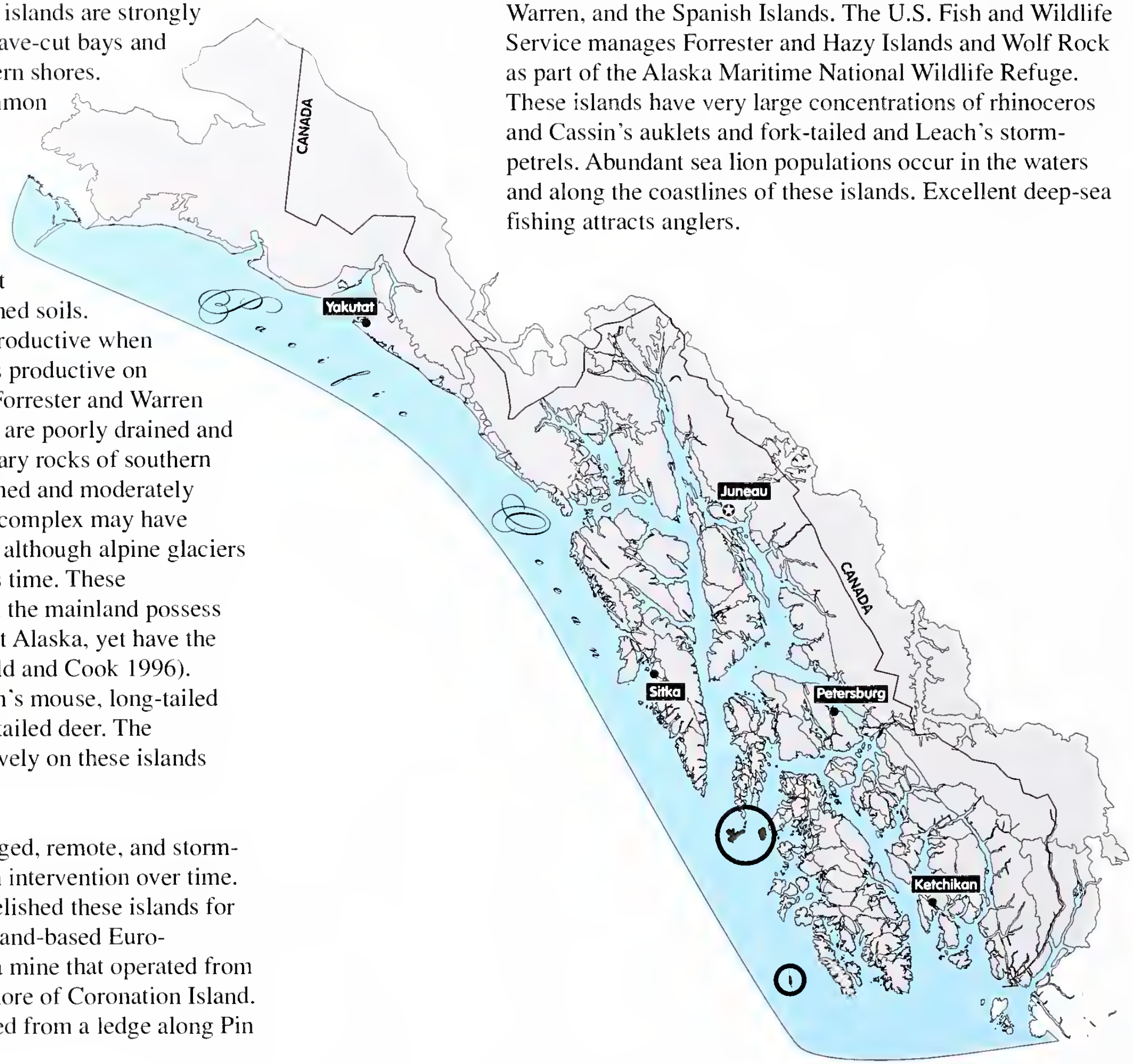




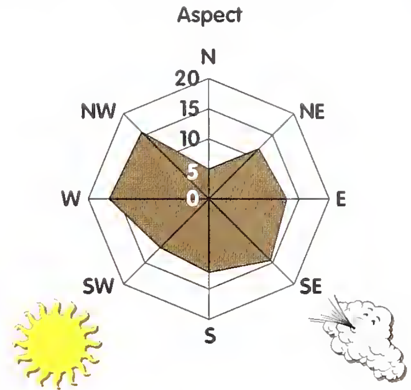


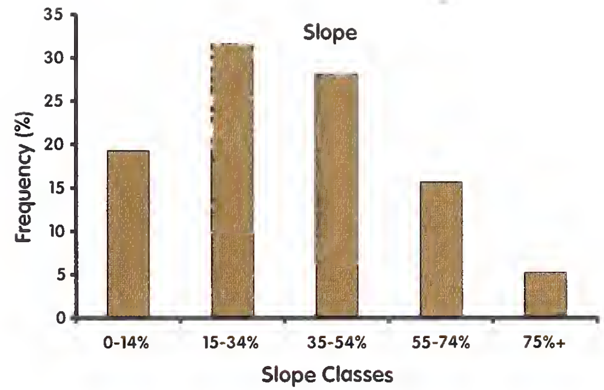
This subsection consists of wave- and storm-beaten islands along the North Pacific, including Forrester, Coronation, Warren, Hazy, and Spanish Islands. These small islands are strongly influenced by oceanic processes, and wave-cut bays and beaches honeycomb western and southern shores. Sea caves in limestone bedrock are common on Coronation Island. Rainfall is moderately high. Watersheds are very small and steep, containing small *cirque* lakes surrounded by *palustrine emergent wetlands*. *Palustrine forested* and *scrub-shrub wetlands* are somewhat restricted by steep slopes and well-drained soils. Soils on Coronation Island are highly productive when formed over limestone bedrock and less productive on sedimentary and granite bedrocks. On Forrester and Warren Islands, soils over granodiorite bedrock are poorly drained and nonproductive. The soils over sedimentary rocks of southern Warren Island are moderately well drained and moderately productive. Substantial portions of this complex may have escaped late-Wisconsin continental ice, although alpine glaciers probably draped the uplands during this time. These geographically isolated islands far from the mainland possess the fewest mammal species in Southeast Alaska, yet have the highest degree of *endemism* (MacDonald and Cook 1996). Common species are dusky shrew, Keen's mouse, long-tailed vole, mink, river otter, and Sitka black-tailed deer. The Coronation Island vole is found exclusively on these islands (Swarth 1933).

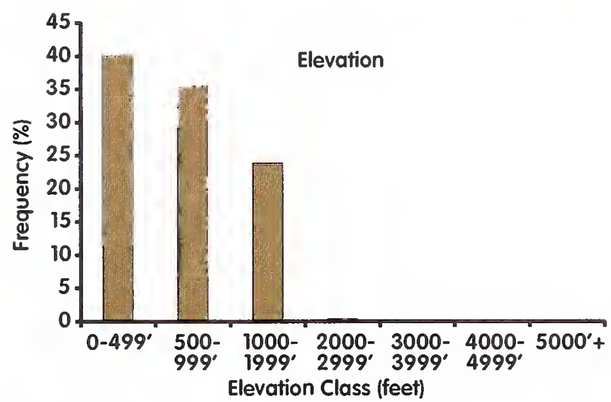
Land-Human Interactions. These rugged, remote, and storm-racked islands have seen limited human intervention over time. Native Klawock and Kaigani Tlingits relished these islands for their abundance of bird eggs. The first land-based Euro-American enterprise was a small galena mine that operated from 1900 to 1920 along the northwestern shore of Coronation Island. Here, lead, silver, and gold was extracted from a ledge along Pin Peak facing Egg Harbor. Today, all islands are designated wilderness. The U.S. Forest Service manages Coronation, Warren, and the Spanish Islands. The U.S. Fish and Wildlife Service manages Forrester and Hazy Islands and Wolf Rock as part of the Alaska Maritime National Wildlife Refuge. These islands have very large concentrations of rhinoceros and Cassin's auklets and fork-tailed and Leach's storm-petrels. Abundant sea lion populations occur in the waters and along the coastlines of these islands. Excellent deep-sea fishing attracts anglers.



The shroud of coastal fog overtaking Warren Island is a common scene within the Outer Island Complex. The eastern shoreline of Warren Island juts up to elevations of 1,000 to 2,000 feet. Located at the archipelago's edge, these islands probably escaped the intense grinding action of continental ice. Local alpine glaciers most likely shaped this steep and dissected landscape.

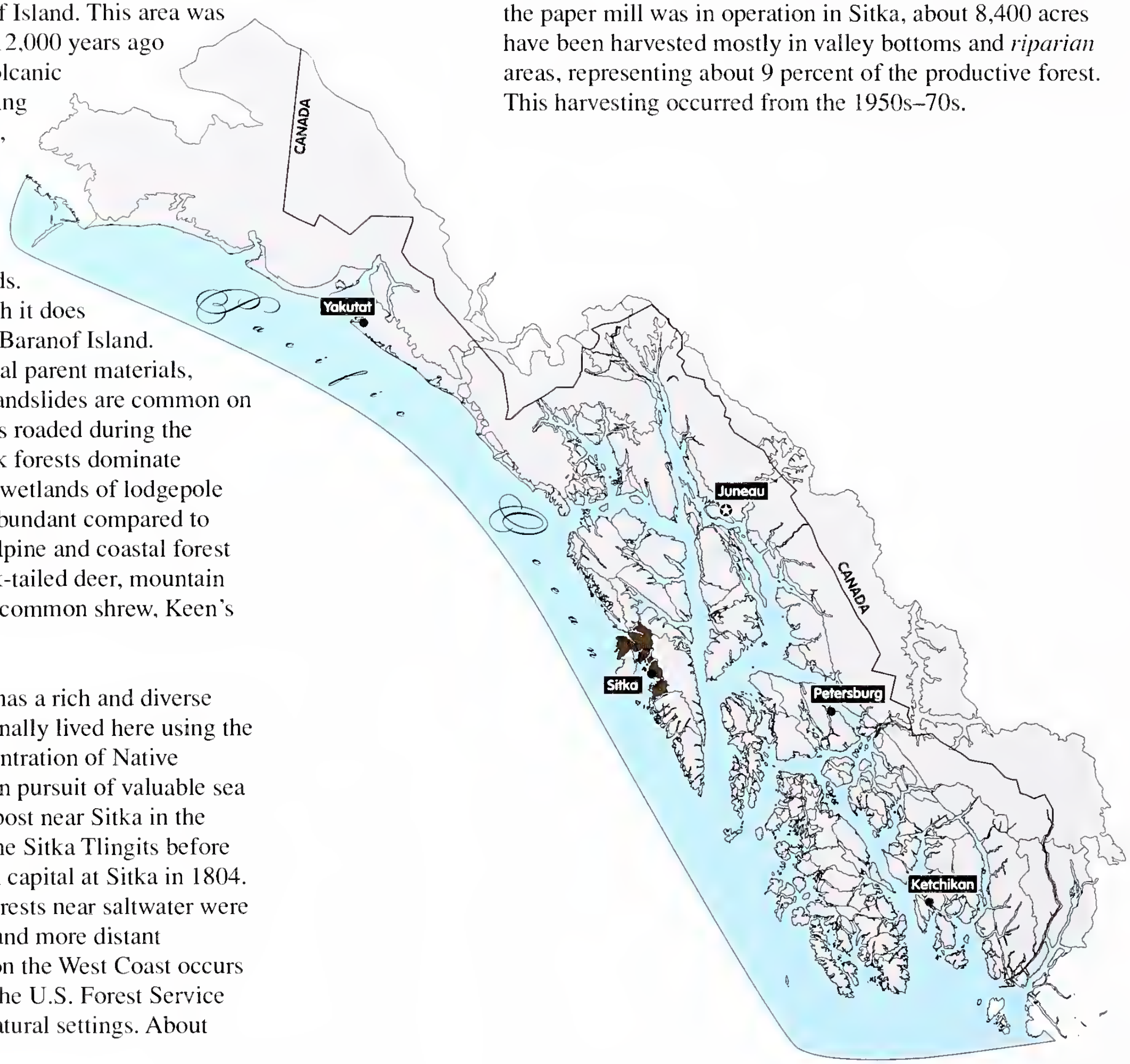




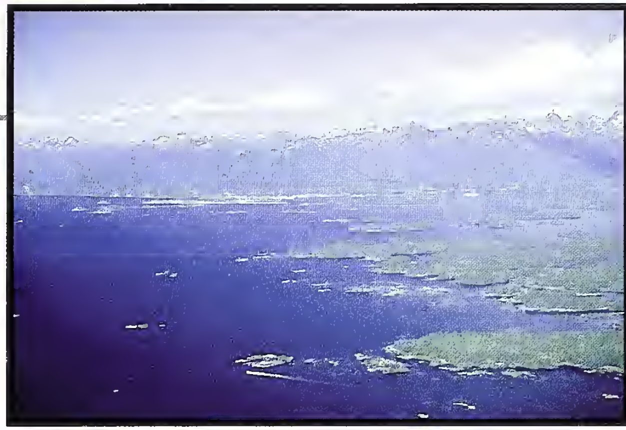


Outer Islands Complex	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms						0
Parent Materials						0
Soils						0
Landcover	Hemlock (52%)	Hemlock-Spruce (15%)	Other (7%)	Rock (7%)	Mixed Conifer (6%)	100
Productivity	Productive Forests (68%)	Nonproductive Forests (25%)	Nonforested (7%)			100
Site Index	SI 0-40 (100%)					100
Wetlands	Upland (80%)	Palustrine Emergent (11%)	Palustrine Forested (7%)	Palustrine Scrub-Shrub (1%)		37
Stream Process Groups						
Land Use Designations	Wilderness & Monument (100%)					100

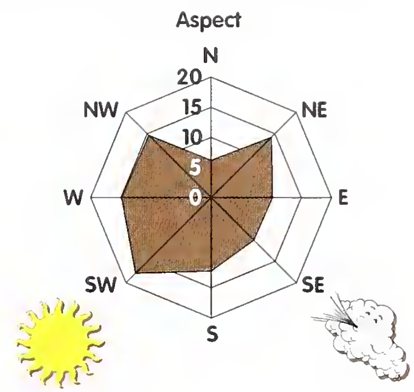
These highlands encircling Sitka Sound include the mountains on northwest Baranof Island, Halleck, Krestof and Partofshikof Islands, and the northern third of Kruzof Island. This area was blanketed by 2 to 6 feet of ash about 9-12,000 years ago (Riehle et al. 1992). Over time, these volcanic deposits have washed downslope exposing the underlying Sitka *graywacke*, granite, and low-grade metamorphic rocks such as phyllites. Much of this area is considerably lower in elevation than surrounding subsections, particularly Halleck, Krestof and Partofshikof Islands. This subsection has no glaciers, although it does contain a few permanent snowfields on Baranof Island. Volcanic ash and cinders are the principal parent materials, covering over 50% of the subsection. Landslides are common on ash-coated surfaces, particularly in areas roaded during the 1960-70s. Hemlock-spruce and hemlock forests dominate shorelines and low elevations. Forested wetlands of lodgepole pine and mixed conifers are relatively abundant compared to bordering subsections to the east. The alpine and coastal forest habitats support brown bear, Sitka black-tailed deer, mountain goat (introduced), marten (introduced), common shrew, Keen's mouse, and tundra vole.



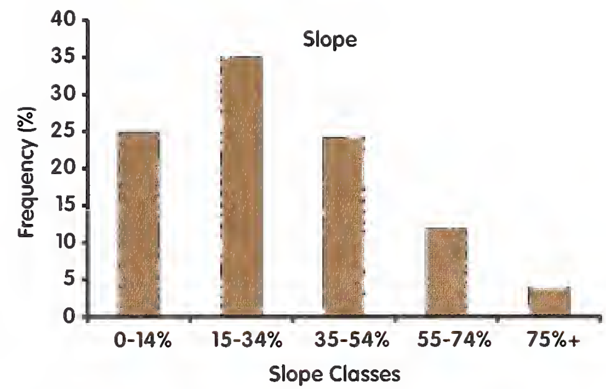
Land-Human Interactions. This area has a rich and diverse cultural history. The Sitka Tlingits originally lived here using the abundant resources of the area. A concentration of Native villages occurred around Sitka Sound. In pursuit of valuable sea otter pelts, the Russians built a trading post near Sitka in the 1790s. A series of battles ensued with the Sitka Tlingits before the Russians established their American capital at Sitka in 1804. During the Russian occupation, most forests near saltwater were selectively logged around Sitka Sound and more distant shorelines. One of the oldest clearcuts on the West Coast occurs on Mount Verstovia near Sitka. Today, the U.S. Forest Service manages much of the area for mostly natural settings. About one-quarter of this subsection is designated for development. Less than 10 percent of the land is privately owned. While the paper mill was in operation in Sitka, about 8,400 acres have been harvested mostly in valley bottoms and *riparian* areas, representing about 9 percent of the productive forest. This harvesting occurred from the 1950s–70s.

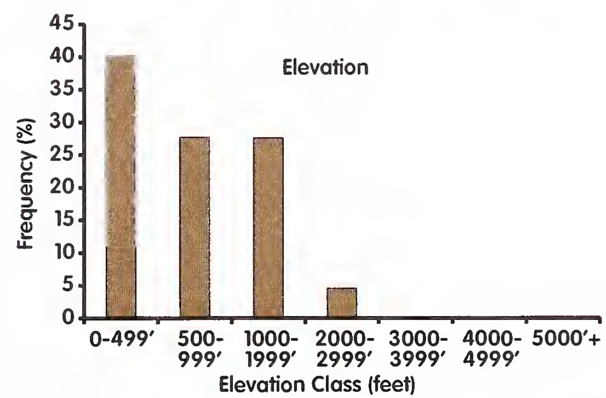


The Outer Coast Wave-cut Terraces front this picturesque view of Sitka and the steep, angular mountains that comprise this subsection. Povorotni Point is in the foreground. The cruise ship on the right is in front of Mt. Verstovia.

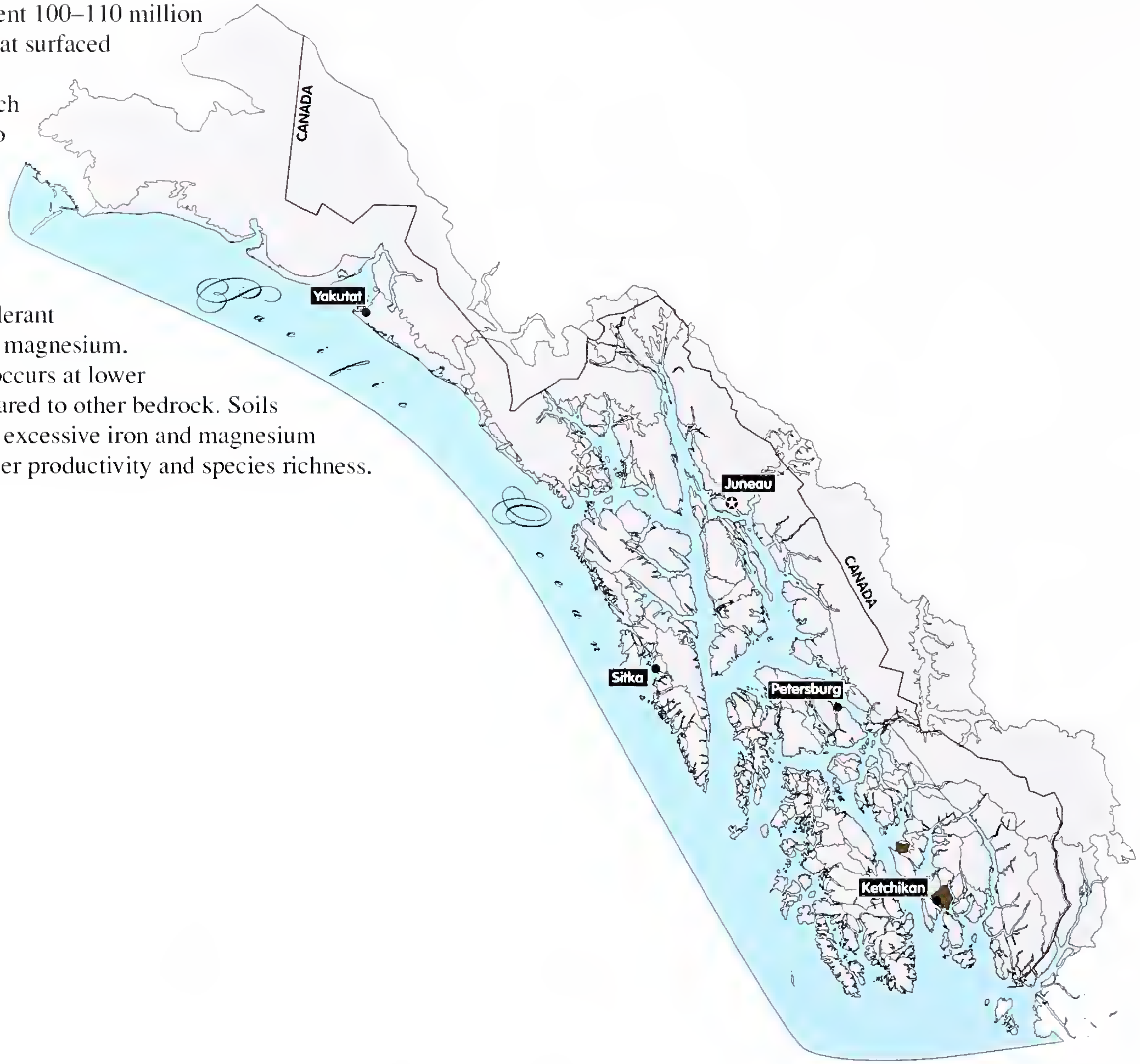


Sitka Sound Complex	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (78%)	Lowlands (8%)	Valley Floor (7%)	Mountain Summits (4%)	Hills (3%)	96
Parent Materials	Volcanic Ejecta (58%)	Organic Material (16%)	Residuum (11%)	Colluvium (9%)	Alluvial (4%)	96
Soils	Spodosols (76%)	Histosols (16%)	Inceptisols (4%)	Miscellaneous (3%)	Entisols (2%)	96
Landcover	Hemlock-Spruce (35%)	Mixed Conifer (13%)	Lodgepole Pine (11%)	Hemlock (11%)	Other (7%)	100
Productivity	Productive Forests (49%)	Nonproductive Forests (36%)	Nonforested (15%)			100
Site Index	SI 61-80 (34%)	SI 0-40 (33%)	SI >80 (17%)	SI 41-60 (16%)		100
Wetlands	Upland (67%)	Palustrine Forested (20%)	Palustrine Emergent (6%)	Palustrine Scrub-Shrub (5%)	Estuarine Intertidal (1%)	100
Stream Process Groups	High Gradient-Contained (65%)	Floodplain (9%)	Moderate Gradient-Contained (9%)	Alluvial Fan (5%)	Moderate Gradient-Mixed Control (5%)	
Land Use Designations	Mostly Natural Setting (67%)	Intensive Development (15%)	Moderate Development (9%)	Private (8%)		100





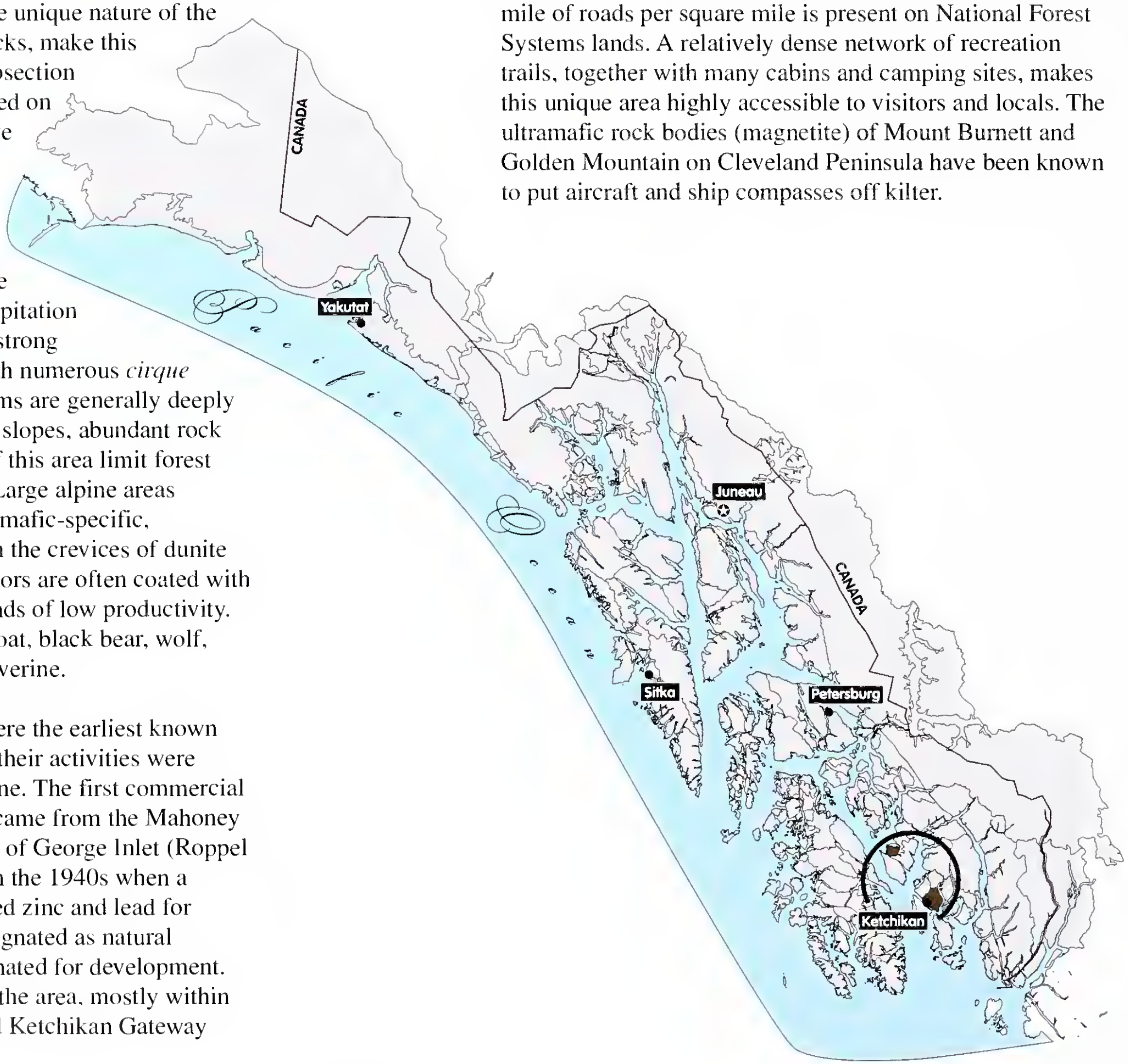
Mafic and ultramafic rocks represent 100–110 million year old ocean crust formations that surfaced in Southeast Alaska through plate *tectonics*. These *plutonic* rocks, rich in iron and magnesium, degrade to form soils that are high in these elements, sometimes to the degree of toxicity to plants. Although sometimes bare, upper slopes and lower ridges are commonly vegetated with flora tolerant of high concentrations of iron and magnesium. The forest-alpine transition zone occurs at lower elevations on these surfaces compared to other bedrock. Soils often have toxic tendencies due to excessive iron and magnesium accumulation, and hence have lower productivity and species richness.



A view looking east from the mountain slopes of Upper Mahoney Lake on Revillagigedo Island. The rock's distinctive reddish color is typical of mafic/ultramafic landscapes. Soils are redder than usual owing to the rock's high iron content. The steep sidewalls of Mahoney Lakes and other cirque lakes in this landscape are typical remnants of alpine glaciation. The mountains in the background are the Coast Mountains, home of Misty Fiords National Monument and part of the Misty Fiords Granitics subsection.

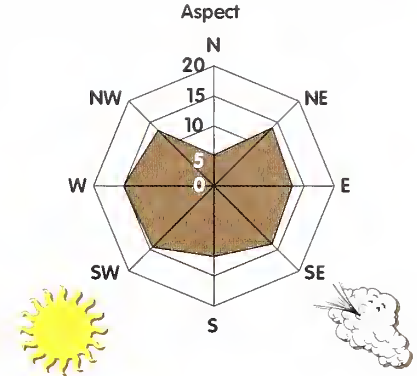
These landscapes are among the most unique in Southeast Alaska. The rugged topography, which rises abruptly from sea level to over 3,000 feet, coupled with the unique nature of the geology and soils derived from these rocks, make this landscape of particular interest. This subsection includes two prominent areas: one located on Revillagigedo Island between Ward Cove and George Inlet, and another on Cleveland Peninsula between Union Bay and Vixen Inlet. Steep mountain slopes with sharp to rounded summits and large areas of rock outcrop dominate the scene. Strong winds and heavy precipitation contact the rugged coastline, creating a strong *orographic* effect. The area is dotted with numerous *cirque* lakes of various sizes. Their outlet streams are generally deeply incised on steep mountain slopes. Steep slopes, abundant rock outcrops, *talusfields*, and unique soils of this area limit forest productivity to moderate to low levels. Large alpine areas occupy the high summits. Here the ultramafic-specific, Kruckeberg's holly fern may be found in the crevices of dunite and peridotite. Footslopes and valley floors are often coated with glacial *till*, giving rise to forested wetlands of low productivity. Common mammals include mountain goat, black bear, wolf, Sitka black-tailed deer, marten, and wolverine.

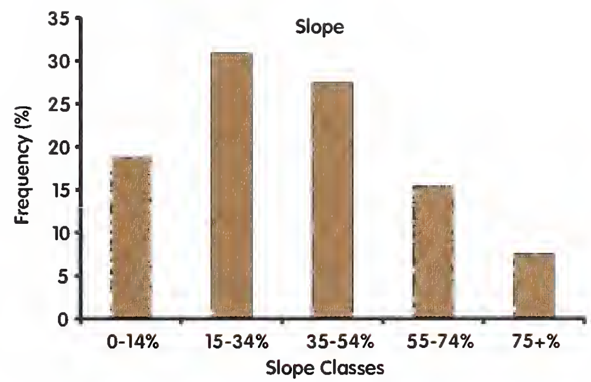
Land-Human Interactions. Tlingits were the earliest known inhabitants of this subsection, although their activities were probably largely restricted to the coastline. The first commercial production of zinc in Southeast Alaska came from the Mahoney Mine that operated along the west shore of George Inlet (Roppel 1991). The majority of ore was mined in the 1940s when a flotation mill erected on site concentrated zinc and lead for shipping. Most of this subsection is designated as natural settings, with relatively few acres designated for development. Private lands occupy about one third of the area, mostly within the Cities of Ketchikan and Saxman and Ketchikan Gateway Borough. About 6 percent of the productive forest lands were harvested during the 1980s and 1990s. Less than one-half mile of roads per square mile is present on National Forest Systems lands. A relatively dense network of recreation trails, together with many cabins and camping sites, makes this unique area highly accessible to visitors and locals. The ultramafic rock bodies (magnetite) of Mount Burnett and Golden Mountain on Cleveland Peninsula have been known to put aircraft and ship compasses off kilter.

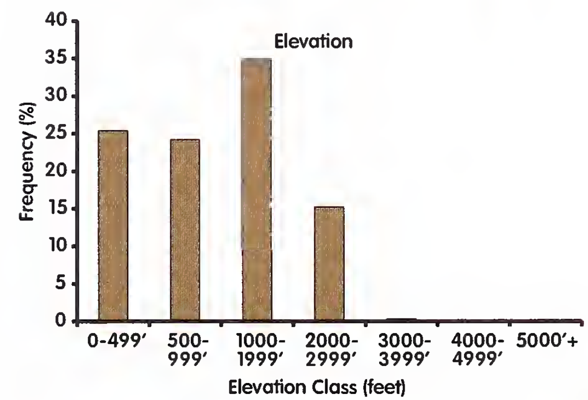


A view of Twin Peaks on Revillagigedo Island illustrates the high elevation and steep terrain of the highly resistant mafic and ultramafic geology of this landscape. The more mafic component of this subsection, shown here, exhibits slightly angular to somewhat rounded topography. The deeply incised drainages that dissect the landscape are supplied by abundant precipitation and alpine meltwaters. Gravina (center and right) and Annette (left) Islands are seen in the distance.

Ketchikan Mafics/Ultra mafics	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (55%)	Mountain Summits (32%)	Valley Floor (9%)	Hills (4%)		71
Parent Materials	Residuum (39%)	Organic Material (20%)	Colluvium (17%)	Bedrock (14%)	Compact Till (4%)	61
Soils	Spodosols (41%)	Histosols (25%)	Inceptisols (18%)	Miscellaneous (14%)	Entisols (2%)	71
Landcover	Brush (27%)	Hemlock (22%)	Alpine (14%)	Other (11%)	Hemlock-Spruce (9%)	100
Productivity	Nonforested (36%)	Productive Forests (34%)	Nonproductive Forests (30%)			100
Site Index	SI >80 (43%)	SI 0-40 (26%)	SI 41-60 (22%)	SI 61-80 (9%)		97
Wetlands	Upland (69%)	Palustrine Forested (21%)	Palustrine Scrub-Shrub (6%)	Lacustrine Limnetic (3%)	Palustrine Emergent (2%)	100
Stream Process Groups	High Gradient-Contained (65%)	Lake (10%)	Moderate Gradient-Mixed Control (8%)	Floodplain (6%)	Moderate Gradient-Contained (5%)	
Land Use Designations	Mostly Natural Setting (66%)	Private (24%)	Intensive Development (7%)	Moderate Development (3%)		100



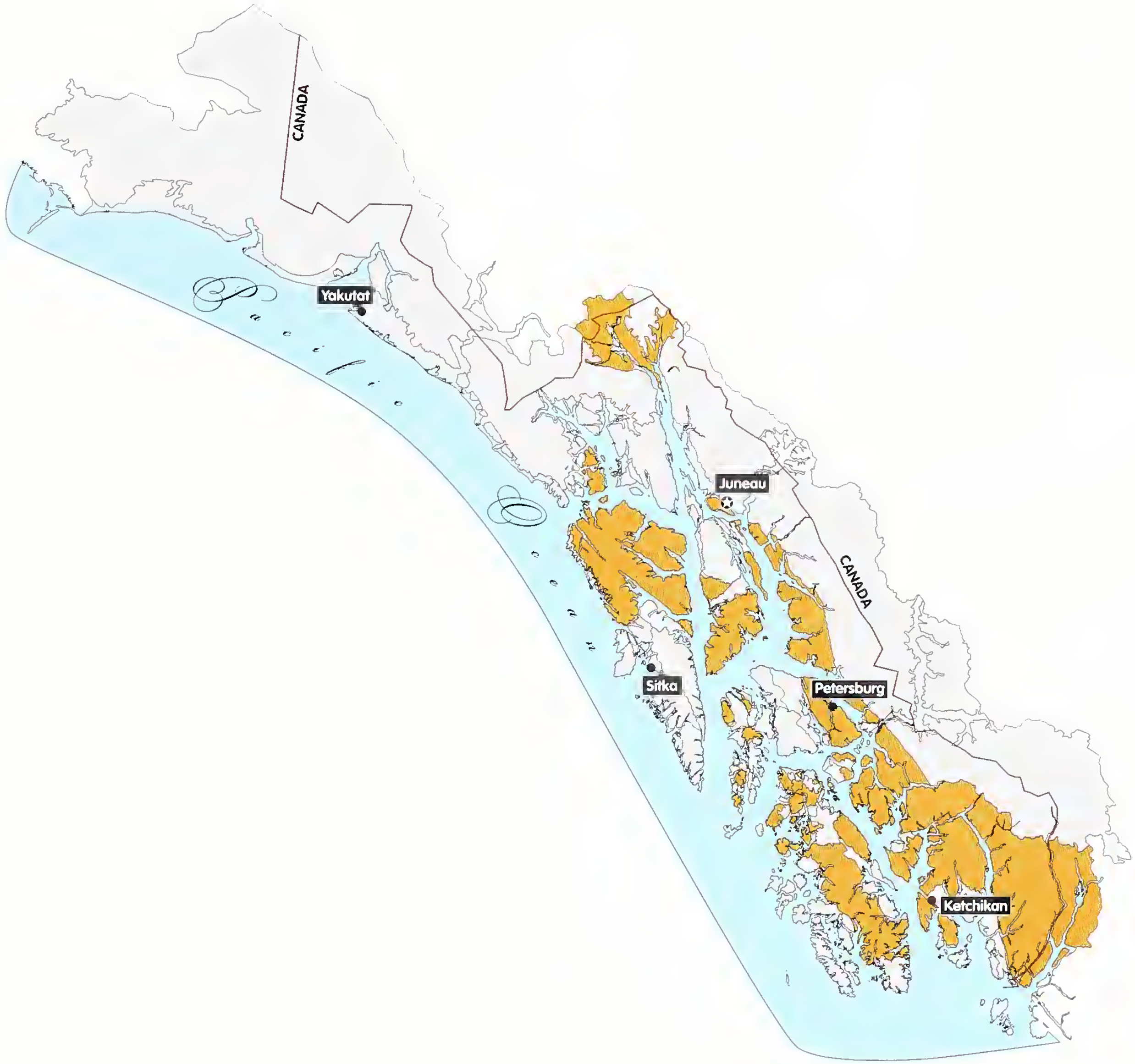




Rounded Mountains

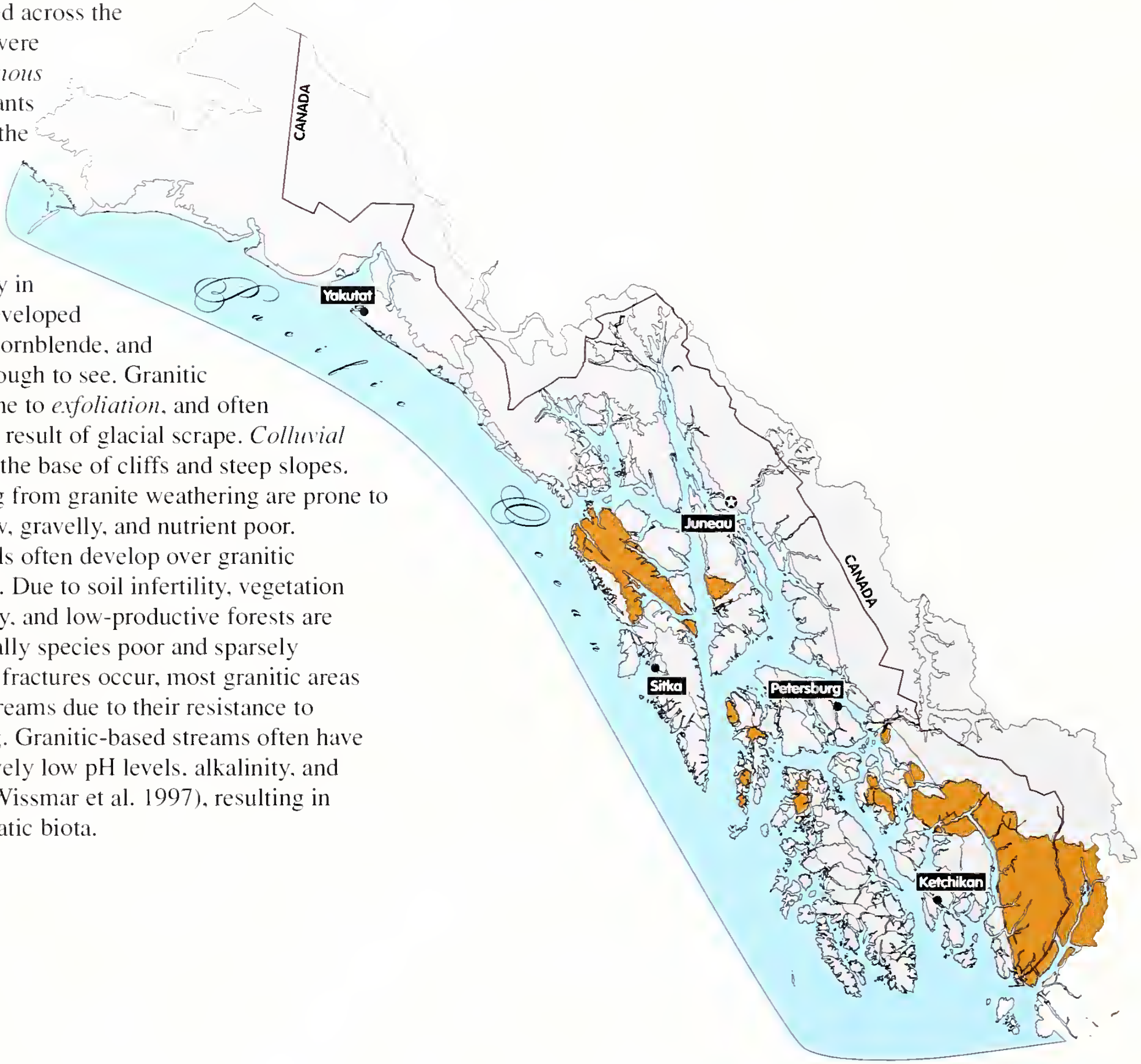
The majority of the *archipelago* has been highly modified by repeated glacial override during the *Pleistocene* (Mann 1986). Massive continental ice sheets rounded mountains and carved deep *fjords* along bedrock weaknesses (faults and *lineaments*). Lynn Canal, Chatham Strait, Cross Sound and other waterways served as major "ice highways" through the *archipelago*. Concurrently, alpine glaciers developed on high *insular* mountains and poured downslope carving U-shaped valleys. These alpine glaciers coalesced with the continental ice sheets to thoroughly scour the surrounding landscape. Many islands including Kupreanof, Mitkof, Wrangell, and Kuiu were completely overridden by ice. Since much of Southeast Alaska consists of heavily glaciated mountainous *terrain*, it follows that most subsections fall into the rounded mountain category.

Rounded mountains differ from angular mountains in several key respects. Rounded mountaintops and ridgelines tend to retain more sediments (weathered and deposited materials) and snow than their angular counterparts. In turn, landslides, debris torrents, and avalanches (though common in very steep areas) are less frequent here than on angular surfaces. With fewer rocky and brushy disturbance chutes on sideslopes, transitions among forested, subalpine, and alpine zones often appear more distinctive on rounded mountains. More extensive development and retention of *ablation* and compact *tills* occur on rounded mountains than on angular mountains. Because of sediment retention at high elevations, a greater proportion of the alpine is vegetated on rounded mountains compared to angular mountains. Rounded mountains tend to drain more slowly than angular mountains. As such, wetlands, particularly high-elevation bogs and fens, are more extensive on rounded mountain compared to angular mountains. Rounded mountains differ from hills by being higher (>2,000 ft.), having alpine and subalpine vegetation zones, and possessing snow cover long into the summer. In mountains, alpine areas are an important source of meltwaters and sediments. Mountain streams usually have higher *bedloads* and more power than hill streams. In turn, *alluvial* fans are common in mountainous *terrain* compared to hilly *terrain*.


CANADA
Yakutat
Pacific Ocean
Juneau
CANADA
Sitka
Petersburg
Ketchikan

Granitics

These *plutonic* bodies are scattered across the archipelago and mainland. They were formed primarily when *allochthonous terranes* (such as island arc remnants of the Pacific Plate) collided into the North American continent. The force of these collisions formed large *magma* chambers at depth, which later cooled into coarse-grained rock. These rocks are gray in appearance and consist of well-developed mineral grains (quartz, feldspar, hornblende, and micas) that are generally large enough to see. Granitic rocks are resistant to erosion, prone to *exfoliation*, and often possess oversteepened slopes as a result of glacial scrape. *Colluvial* materials often accumulate along the base of cliffs and steep slopes. The granular materials originating from granite weathering are prone to erosion and soils are often shallow, gravelly, and nutrient poor. Shallow, well-drained organic soils often develop over granitic bedrocks in gently sloping terrain. Due to soil infertility, vegetation tends to be less robust and scrubby, and low-productive forests are common. Alpine areas are especially species poor and sparsely vegetated. Except where faults or fractures occur, most granitic areas tend to be shallowly incised by streams due to their resistance to physical and chemical weathering. Granitic-based streams often have well-rounded bedloads and relatively low pH levels, alkalinity, and dissolved solute concentrations (Wissmar et al. 1997), resulting in lower primary production for aquatic biota.

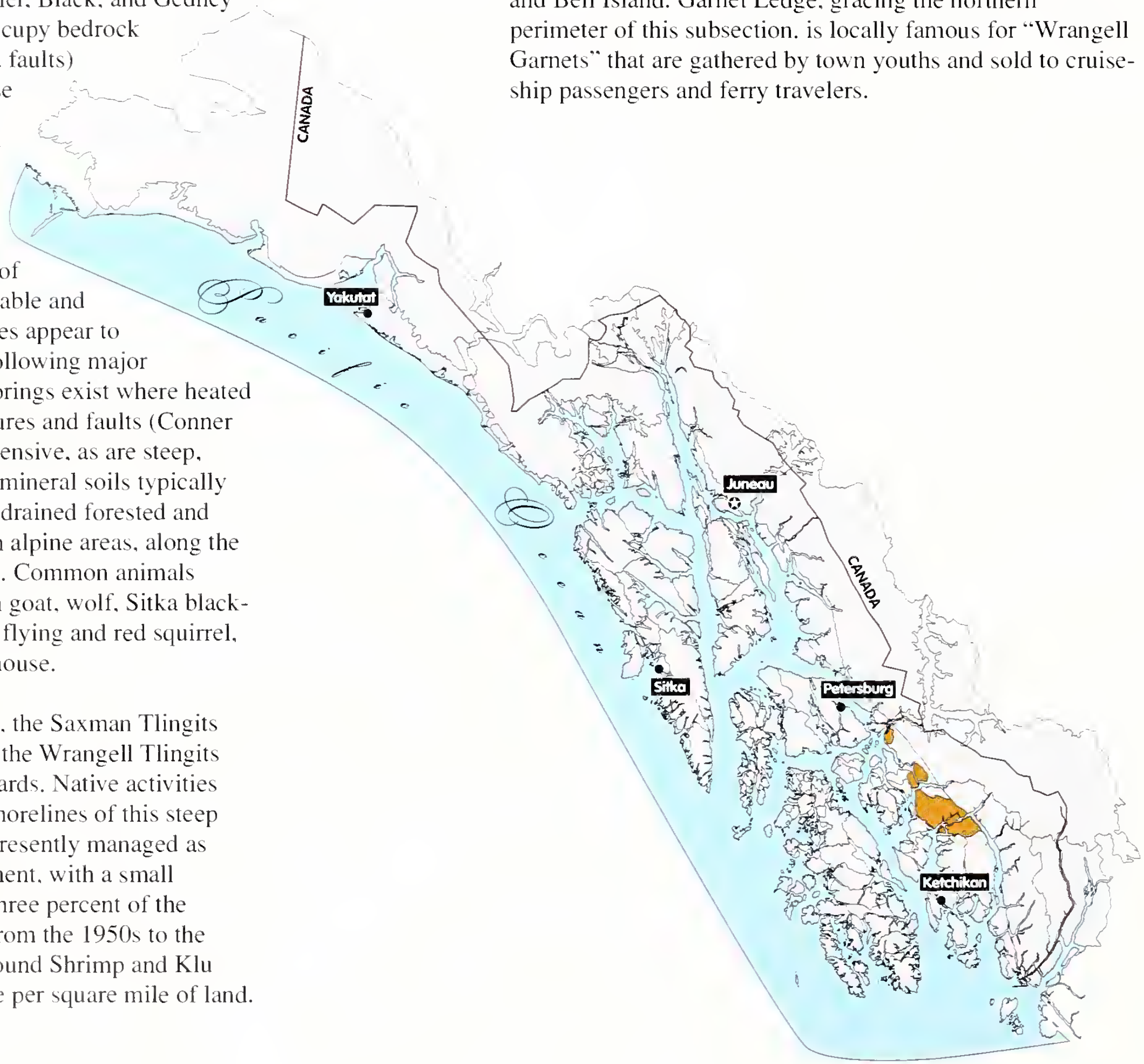


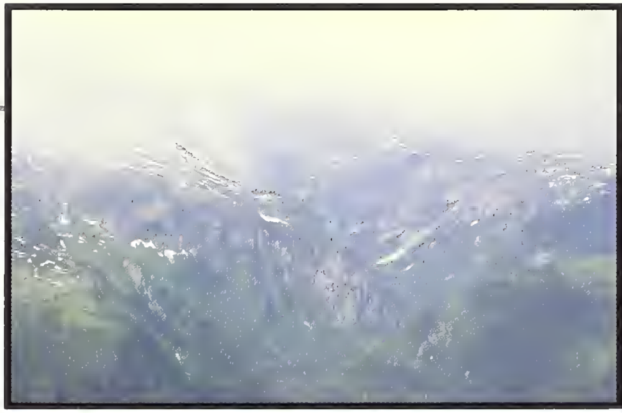
The resistant granitics near Rust Mountain have vividly retained the scrapes and scours of glacial ice. The deep grooves clearly indicate the direction of ice flow across this portion of western Chichagof Island. Note the depauperate nature of the alpine vegetation.

This subsection is located at the northern tip of Revillagigedo Island and on the Cleveland Peninsula from Yes Bay as far north as Anan Bay. It also includes Bell, Hassler, Black, and Gedney Islands. Long, narrow bays and lakes occupy bedrock weaknesses (often along *lineaments* and faults) where the glaciers scoured this otherwise resistant rock. The northwest-southeast orientation of these water bodies clearly illustrates the direction that continental ice sheets once flowed. Numerous *cirque* lakes radiating from rounded mountain summits are further evidence of smaller-scale alpine glaciation. Fairly stable and contained streams on the mountain slopes appear to reflect the bedrock architecture, often following major *lineaments* and faults. Occasional hot springs exist where heated water upwells from deep geologic fractures and faults (Conner and O'Haire 1988). Alpine areas are extensive, as are steep, forested mountain slopes. Well-drained mineral soils typically occur on steep mountain slopes. Poorly drained forested and nonforested wetlands are interspersed in alpine areas, along the lake margins, and in the low-lying areas. Common animals include black and brown bear, mountain goat, wolf, Sitka black-tailed deer, marten, wolverine, northern flying and red squirrel, southern red-backed vole, and Keen's mouse.

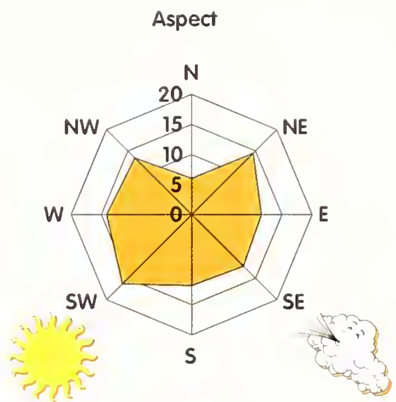
Land-Human Interactions. In the past, the Saxman Tlingits occupied the Behm Canal area whereas the Wrangell Tlingits inhabited the Ernest Sound area northwards. Native activities were probably concentrated along the shorelines of this steep and rugged *terrain*. This subsection is presently managed as natural settings, wilderness, and monument, with a small component of development. Less than three percent of the productive forestlands were harvested from the 1950s to the 1990s, mainly on Hassler Island and around Shrimp and Klu Bays. Road density is less than one mile per square mile of land.

Several privately-owned resorts are within this subsection, some associated with hot springs at Yes Bay, Lake Shelokum, and Bell Island. Garnet Ledge, gracing the northern perimeter of this subsection, is locally famous for "Wrangell Garnets" that are gathered by town youths and sold to cruise-ship passengers and ferry travelers.

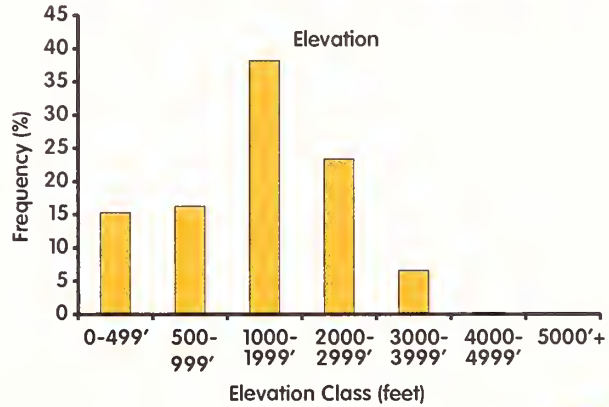




This view of Bell Island Granitics looks northwestward up Claude Creek drainage on Revillagigedo Island. The landscape is draped in fog, typical of a mid August day in this country. Drainages flow along major geologic lineaments and faults through these resistant granitics. Alpine areas are extensive, as are steep, forested mountain slopes. The peaks in this area reach over 4,000 feet tall. Barely visible is Behm Narrows in the background.



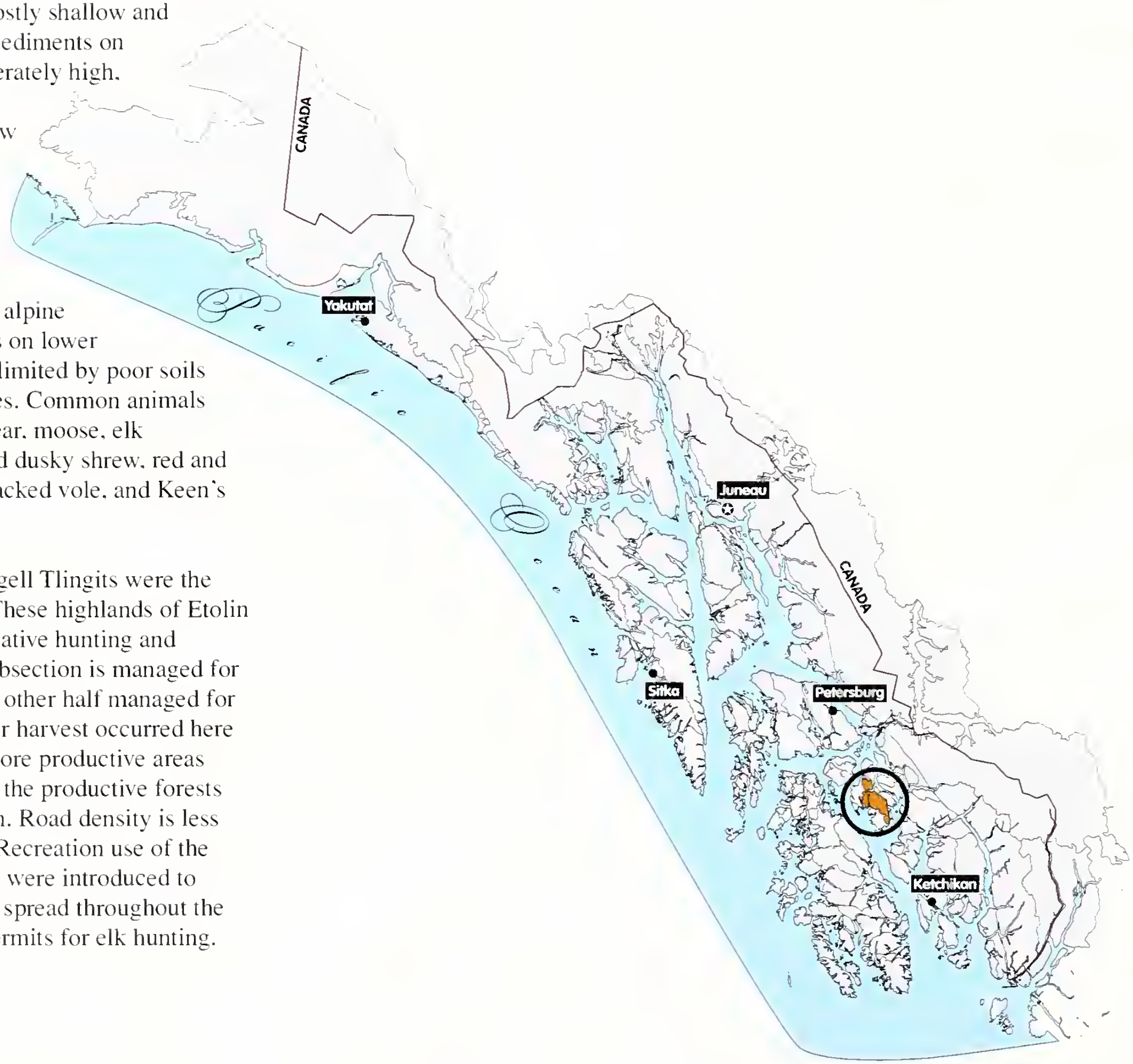
Bell Island Granitics	Ranked Order					% GRID reporting data
	1st	2nd	3rd	4th	5th	
Landforms	Mountain Slopes (66%)	Mountain Summits (23%)	Lowlands (6%)	Valley Floor (3%)	Hills (2%)	82
Parent Materials	Residuum (43%)	Organic Material (32%)	Colluvium (10%)	Bedrock (9%)	Glacial Till (2%)	72
Soils	Histosols (45%)	Spodosols (41%)	Miscellaneous (8%)	Inceptisols (4%)	Entisols (1%)	82
Landcover	Hemlock (34%)	Alpine (26%)	Other (10%)	Hemlock-Spruce (8%)	Lodgepole Pine (7%)	100
Productivity	Productive Forests (43%)	Nonproductive Forests (39%)	Nonforested (18%)			100
Site Index	SI 0-40 (48%)	SI 41-60 (30%)	SI >80 (11%)	SI 61-80 (11%)		99
Wetlands	Upland (66%)	Palustrine Forested (15%)	Palustrine Emergent (14%)	Lacustrine Limnetic (3%)	Palustrine Scrub-Shrub (1%)	100
Stream Process Groups	High Gradient-Contained (64%)	Lake (14%)	Moderate Gradient-Contained (6%)	Moderate Gradient-Mixed Control (6%)	Floodplain (4%)	
Land Use Designations	Mostly Natural Setting (66%)	Wilderness & Monument (14%)	Intensive Development (10%)	Moderate Development (9%)		100

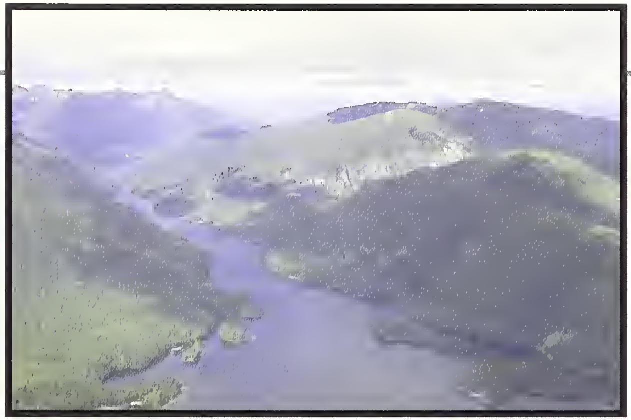


Etolin Granitics

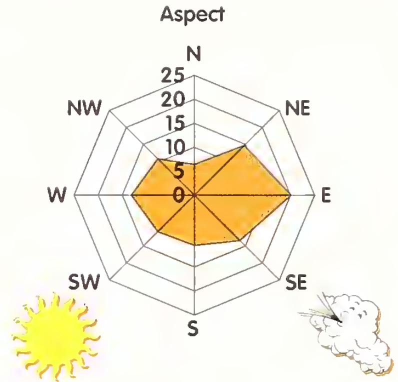
This granitic intrusion stands above the less resistant formations on Etolin Island. Glaciers have sculptured it into very rough mountain slopes and summits. Soils, mostly shallow and organic, overlie a thin layer of mineral sediments on bedrock. Although precipitation is moderately high, steep slopes limit wetlands to a minor component of the landscape on wide, low elevation (<600 feet) valley bottoms. Streams are mostly *high gradient and contained*. Several high elevation lakes are present. Alpine vegetation covers extensive areas within this subsection. Extensive alder brushfields separate the alpine from hemlock, spruce, and cedar forests on lower mountain slopes. Forest productivity is limited by poor soils except on *colluvial* deposits at footslopes. Common animals include Sitka black-tailed deer, black bear, moose, elk (introduced), wolf, marten, common and dusky shrew, red and northern flying squirrel, southern red-backed vole, and Keen's mouse.

Land-Human Interactions. The Wrangell Tlingits were the earliest known inhabitants of the area. These highlands of Etolin Island were probably used mainly for Native hunting and trapping. Currently, about half of the subsection is managed for wilderness and natural settings with the other half managed for development. Until recently, little timber harvest occurred here because logging was concentrated on more productive areas elsewhere. However, about 5 percent of the productive forests have been recently cut in this subsection. Road density is less than 0.2 miles of road per square mile. Recreation use of the area is mostly deer and elk hunting. Elk were introduced to Etolin Island in the late 1980s and have spread throughout the island. A limited drawing now issues permits for elk hunting.

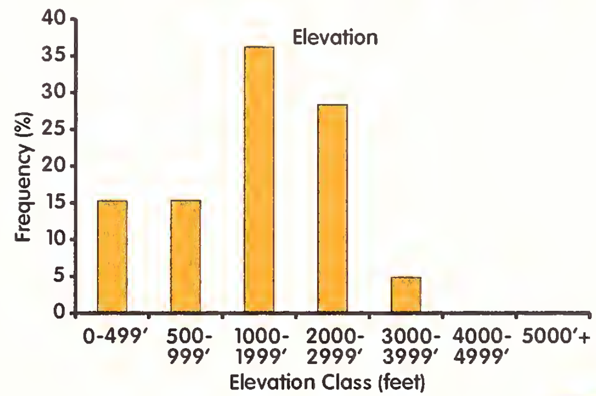




A view looking north up Burnett Inlet on Etolin Island. Cannery Point is at the lower left and South and North Burnett Islands are on the right. The exposed rock surfaces in the center-right of the photo are common features of the steep granitic slopes.



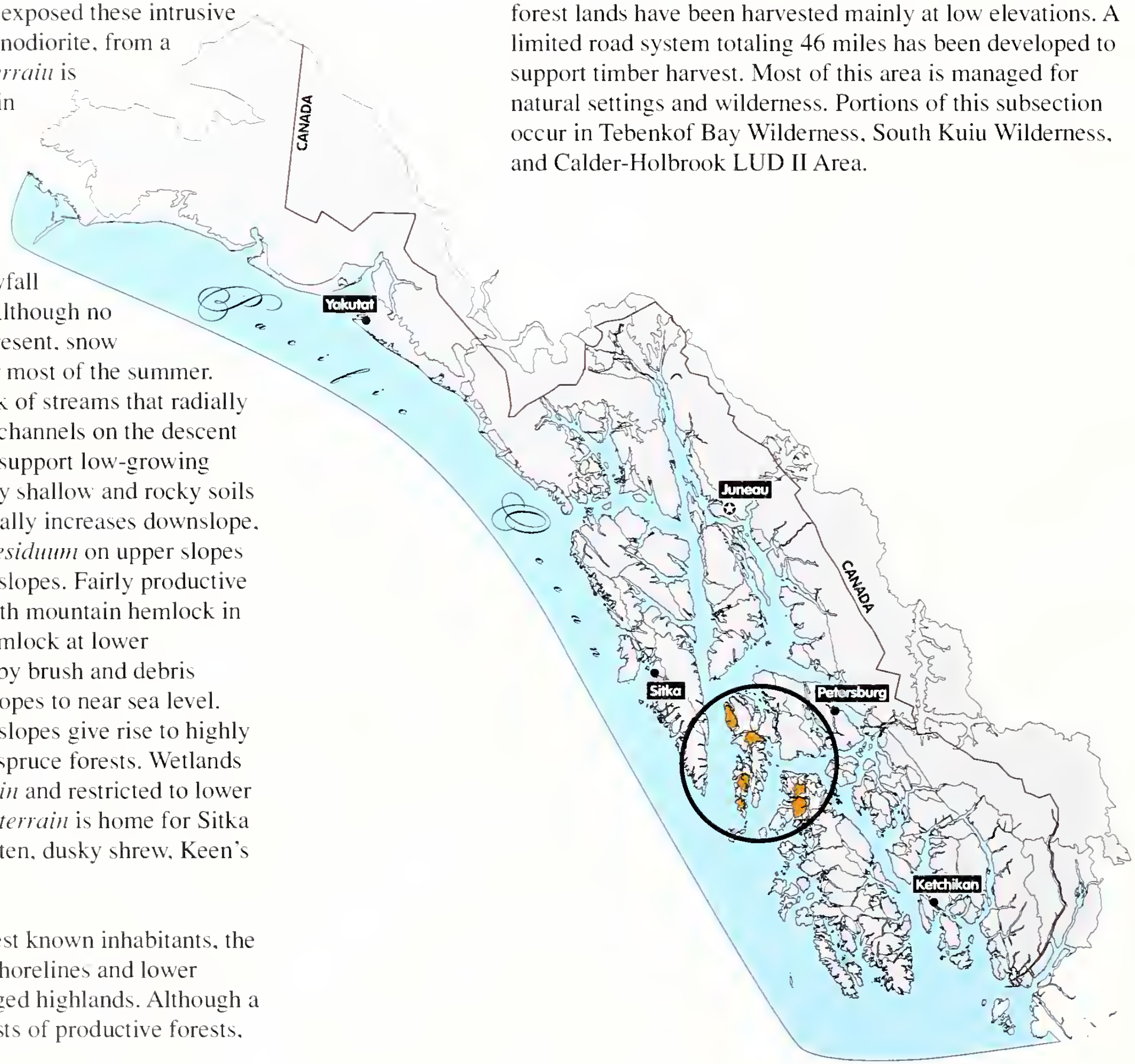
Etolin Granitics	1st	2nd	3rd	4th	5th	% GRID reporting data
	Ranked Order					
Landforms	Mountain Slopes (47%)	Mountain Summits (30%)	Lowlands (17%)	Hills (4%)	Valley Floor (2%)	97
Parent Materials	Residuum (59%)	Ablation Till (11%)	Bedrock (11%)	Colluvium (10%)	Glacial Drift (4%)	85
Soils	Histosols (44%)	Spodosols (39%)	Miscellaneous (10%)	Inceptisols (7%)	Entisols (1%)	97
Landcover	Alpine (30%)	Hemlock (24%)	Hemlock-Spruce (12%)	Other (9%)	Mixed Conifer (7%)	100
Productivity	Nonproductive Forests (44%)	Productive Forests (38%)	Nonforested (19%)			100
Site Index	SI 41-60 (43%)	SI 0-40 (37%)	SI 61-80 (17%)	SI >80 (3%)		100
Wetlands	Upland (80%)	Palustrine Forested (8%)	Palustrine Emergent (7%)	Lacustrine Limnetic (2%)	Palustrine Scrub-Shrub (2%)	100
Stream Process Groups	High Gradient-Contained (74%)	Lake (8%)	Moderate Gradient-Mixed Control (6%)	Alluvial Fan (4%)	Moderate Gradient-Contained (3%)	
Land Use Designations	Wilderness & Monument (37%)	Moderate Development (26%)	Mostly Natural Setting (19%)	Intensive Development (19%)		100



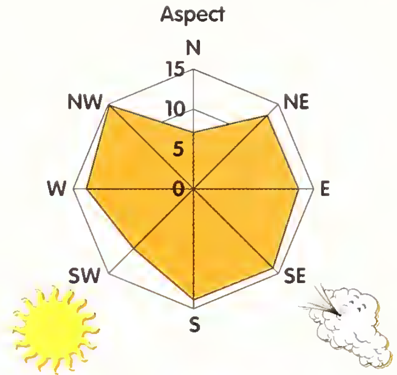
Kuiu–Prince of Wales Granitics

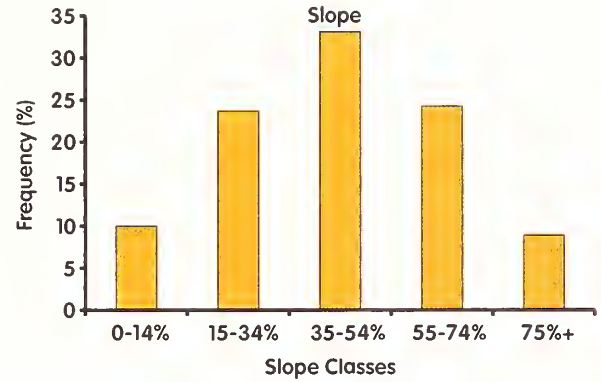
Isolated blocks of *plutonic* mountains jut above the surrounding landscape on Kuiu and north Prince of Wales Islands. Natural weathering and erosion processes have exposed these intrusive rock bodies, principally granite and granodiorite, from a matrix of *accreted* rocks. The rugged *terrain* is composed primarily of smooth mountain slopes below extensive areas of semi-rounded alpine mountaintops. These relatively high mountains are often shrouded in fog and intercept moderately high levels of precipitation through *orographic* lift. Extensive snowfall occurs in the alpine above 2,000 feet. Although no permanent snowfields or glaciers are present, snow packs persist on north-facing slopes for most of the summer. Alpine meltwaters feed a dense network of streams that radially dissect mountains in shallowly incised channels on the descent to saltwater. Shallow organic soils that support low-growing alpine vegetation transition to extremely shallow and rocky soils on steep upper slopes. Soil depth gradually increases downslope, with well-drained soils developing in *residuum* on upper slopes and *colluvium* and glacial *till* on lower slopes. Fairly productive forests cover these mountain slopes, with mountain hemlock in the subalpine giving way to western hemlock at lower elevations. Avalanche chutes occupied by brush and debris frequently cut through these forested slopes to near sea level. Large *alluvial* fans lining mountain toeslopes give rise to highly productive western hemlock and Sitka spruce forests. Wetlands are rather infrequent on this steep *terrain* and restricted to lower slopes and valley bottoms. The rugged *terrain* is home for Sitka black-tailed deer, black bear, wolf, marten, dusky shrew, Keen's mouse, and long-tailed vole.

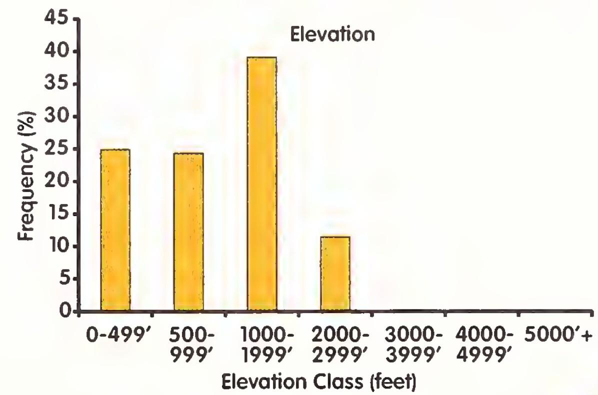
Land-Human Interactions. The earliest known inhabitants, the Tlingits, probably limited their use to shorelines and lower stream and river segments of these rugged highlands. Although a high percentage of the landcover consists of productive forests, upper slopes are generally considered too steep for forest management. To date, about 6 percent of the productive forest lands have been harvested mainly at low elevations. A limited road system totaling 46 miles has been developed to support timber harvest. Most of this area is managed for natural settings and wilderness. Portions of this subsection occur in Tebenkof Bay Wilderness, South Kuiu Wilderness, and Calder-Holbrook LUD II Area.



Looking east from the salt chuck at the head of Bay of Pillars, Kuiu Island. The narrow isthmus between the salt chuck and Port Camden can be seen on the left of the photo. The rugged, snow-capped mountains rising above the surrounding landscape on the right characterize this subsection. These granitic mountains often maintain snow cover into late summer.







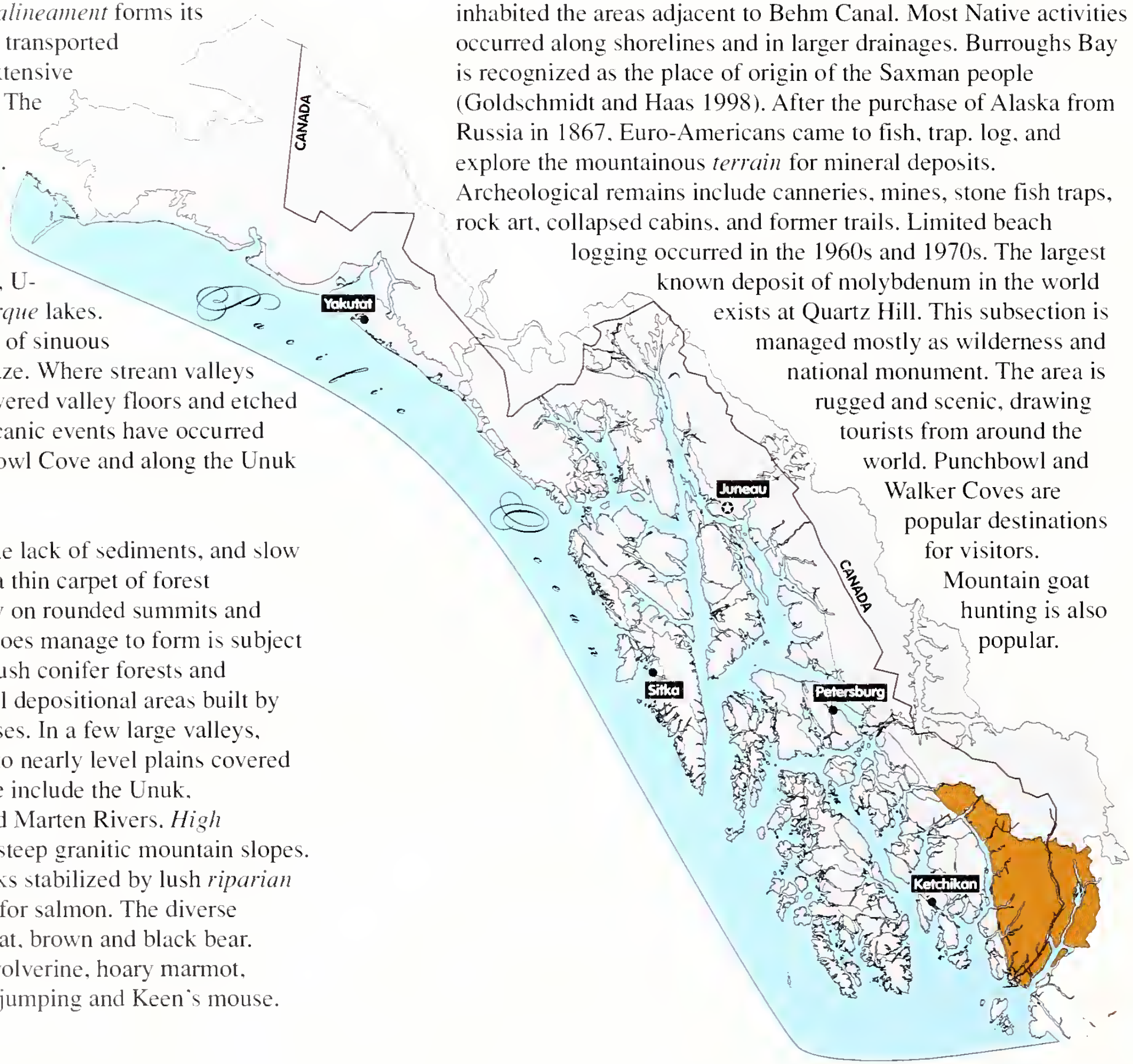
Kuiu-POW Granitics	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (57%)	Mountain Summits (17%)	Valley Floor (9%)	Hills (8%)	Lowlands (8%)	71
Parent Materials	Residuum (56%)	Colluvium (18%)	Organic Material (8%)	Ablation Till (7%)	Bedrock (4%)	68
Soils	Spodosols (54%)	Histosols (32%)	Inceptisols (8%)	Miscellaneous (5%)	Entisols (1%)	71
Landcover	Hemlock (33%)	Hemlock-Spruce (23%)	Alpine (12%)	Other (9%)	Landslides (6%)	100
Productivity	Productive Forests (59%)	Nonproductive Forests (25%)	Nonforested (15%)			100
Site Index	SI 41-60 (44%)	SI 0-40 (25%)	SI 61-80 (17%)	SI >80 (14%)		82
Wetlands	Upland (81%)	Palustrine Forested (10%)	Palustrine Emergent (6%)	Palustrine Scrub-Shrub (1%)	Lacustrine Limnetic (1%)	100
Stream Process Groups	High Gradient-Contained (81%)	Moderate Gradient-Mixed Control (6%)	Moderate Gradient-Contained (3%)	Lake (3%)	Alluvial Fan (3%)	
Land Use Designations	Mostly Natural Setting (61%)	Wilderness & Monument (19%)	Intensive Development (17%)	Moderate Development (3%)		100

Misty Fiords Granitics

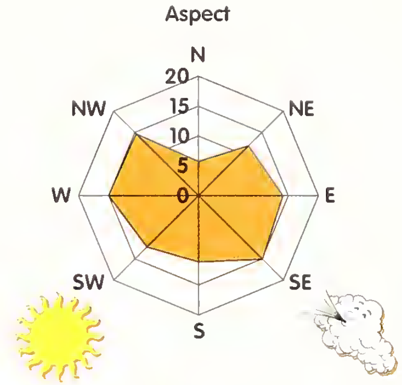
A great granitic *batholith* underlies this scenic mainland subsection extending from the Portland-Observatory Inlet area northwards to Bradfield Canal. The Coast Range *megalineament* forms its western boundary. *Tectonic* forces have transported rocks (*accreted terranes*) and caused extensive bedrock folding, faulting, and warping. The resulting heat and pressure caused metamorphic rocks and *magma* to form. The cooling of *magma* deep inside the earth gave rise to a *batholith*. This was followed by glacial scour that removed less resistant rocks, leaving huge *fjords*, U-shaped valleys, *hanging valleys*, and *cirque* lakes. From far above, the repeating sequence of sinuous valleys and ridges resembles a giant maze. Where stream valleys followed faults and weaknesses, ice lowered valley floors and etched cliffs onto sidewalls. A few limited volcanic events have occurred since glaciation, specifically at Punchbowl Cove and along the Unuk River at Blue Lake.

The general steepness of the country, the lack of sediments, and slow weathering of granitics has resulted in a thin carpet of forest communities. Alpine occurs extensively on rounded summits and along steep talus slopes. Any soil that does manage to form is subject to erosion or sliding off steep slopes. Lush conifer forests and brushfields are mostly confined to small depositional areas built by post-glacial river and avalanche processes. In a few large valleys, rivers have graded glacial sediments into nearly level plains covered by *palustrine emergent wetlands*. These include the Unuk, Chickamin, Wilson, Blossom, Keta, and Marten Rivers. *High gradient contained streams* dissect the steep granitic mountain slopes. Large valley floodplains, with riverbanks stabilized by lush *riparian* forests, provide fine spawning habitats for salmon. The diverse mountain habitats support mountain goat, brown and black bear, Sitka black-tailed deer, wolf, marten, wolverine, hoary marmot, southern red-backed vole, and western jumping and Keen's mouse.

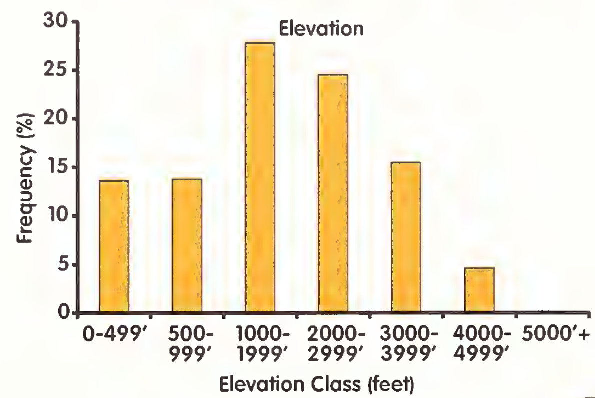
Land-Human Interactions. The Tongass Tlingits originally resided in the Portland Inlet area, whereas the Saxman Tlingits inhabited the areas adjacent to Behm Canal. Most Native activities occurred along shorelines and in larger drainages. Burroughs Bay is recognized as the place of origin of the Saxman people (Goldschmidt and Haas 1998). After the purchase of Alaska from Russia in 1867, Euro-Americans came to fish, trap, log, and explore the mountainous *terrain* for mineral deposits. Archeological remains include canneries, mines, stone fish traps, rock art, collapsed cabins, and former trails. Limited beach logging occurred in the 1960s and 1970s. The largest known deposit of molybdenum in the world exists at Quartz Hill. This subsection is managed mostly as wilderness and national monument. The area is rugged and scenic, drawing tourists from around the world. Punchbowl and Walker Coves are popular destinations for visitors. Mountain goat hunting is also popular.



Rugged granitic mountains jutting from sea level to over 4,000 feet characterize this spectacular landscape. Humpback Lake, seen here, is located just south of Marten Arm in the southern mainland. Deep fiords, long linear lakes, U-shaped valleys, hanging valleys, and cirque lakes were formed from past glaciers following geologic weaknesses in the otherwise resistant granitic bedrock of this region.

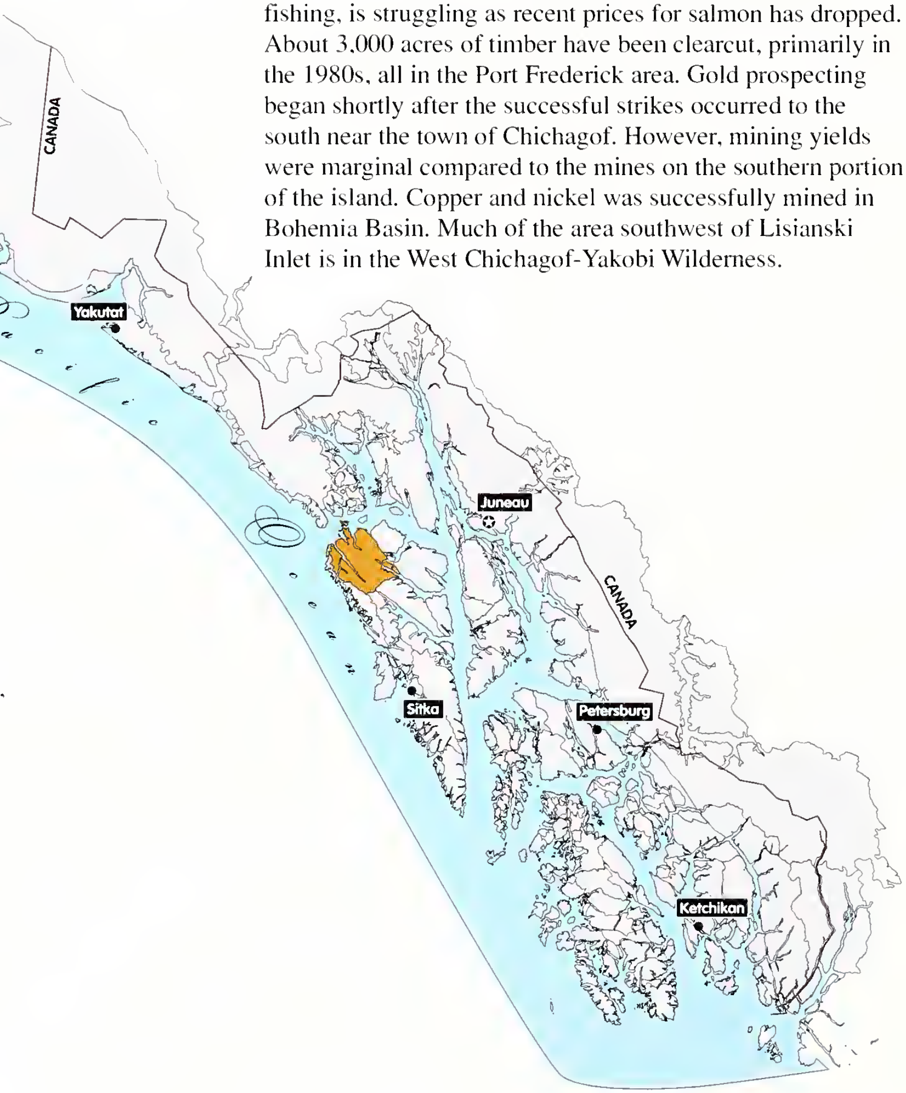


Misty Fiords Granitics	Ranked Order					% GRID reporting data
	1st	2nd	3rd	4th	5th	
Landforms	Mountain Slopes (48%)	Mountain Summits (43%)	Valley Floor (7%)	Lowlands (1%)	Coastal (1%)	4
Parent Materials	Residuum (74%)	Colluvium (9%)	Organic Material (8%)	Bedrock (5%)	Alluvial (2%)	4
Soils	Histosols (49%)	Spodosols (32%)	Miscellaneous (9%)	Inceptisols (8%)	Entisols (2%)	4
Landcover	Alpine (43%)	Hemlock (21%)	Other (7%)	Mixed Conifer (6%)	Brush (6%)	100
Productivity	Nonforested (38%)	Nonproductive Forests (34%)	Productive Forests (27%)			100
Site Index	SI 0-40 (98%)	SI 41-60 (2%)				91
Wetlands	Upland (83%)	Palustrine Forested (8%)	Palustrine Emergent (5%)	Palustrine Scrub-Shrub (2%)	Lacustrine Limnetic (1%)	100
Stream Process Groups	High Gradient-Contained (68%)	Moderate Gradient-Mixed Control (8%)	Floodplain (8%)	Lake (5%)	Palustrine (3%)	
Land Use Designations	Wilderness & Monument (96%)	Mostly Natural Setting (2%)	Intensive Development (1%)			100



North Chichagof Granitics

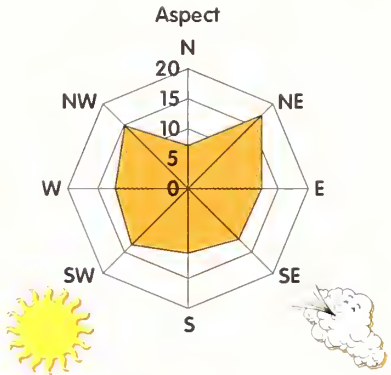
This subsection spans the northwestern sector of Chichagof Island from Cross Sound to northern Tenakee Inlet, including most of Yakobi Island. This area is primarily made up of granitics, but also contains various low-grade metamorphic formations such as schist and narrow bands of marble (Rossman 1959). Occasional *nunataks* jut above the surrounding rounded ridges. This subsection has a very rough surface with steep-sided U-shaped valleys and *fjords* cutting along fault systems. This area experienced severe scouring by continental ice sheets and a small coalescing glacier in the upper reaches of Lisianski Inlet (Reed and Coats 1941). There are a high proportion of *hanging valleys* with cascading waterfalls and river gorges entering salt water. Numerous lakes and ponds presently fill scoured depressions left by past glaciers. Forest cover is sparser here than in most areas of the *archipelago*. Productive forests are generally limited to small *alluvial* fans and *colluvial* cones. Alder and landslide tracks are nearly as common as forested areas. Subalpine meadows and bare rock dominate areas above 1,500 feet and are common on ridges at much lower elevations. Common mammals of this mountainous subsection include brown bear, Sitka black-tailed deer, marten (introduced), ermine, red squirrel (introduced), common shrew, Keen's mouse, and long-tailed vole.

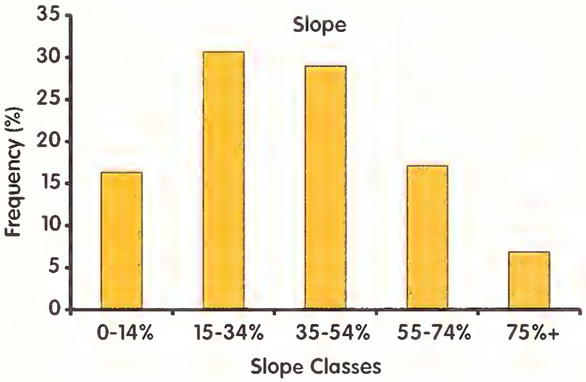


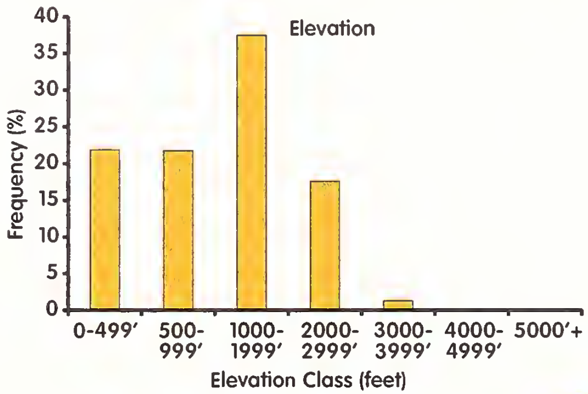
Land-Human Interactions. Hoonah Tlingits resided in this area prior to European arrival. On the Inian Islands, the Chookaneidí clan dried halibut and seaweed, trapped mink, picked salmonberries, and hunted deer and seals (Goldschmidt and Haas 1998). Villages and summer fish camps dotted the northern shoreline of Chichagof Island where Natives fished (halibut and salmon), hunted (deer and seals), and trapped (furbearers). Today, the land is managed for mostly natural settings and wilderness. Some development is allowed near Port Frederick. The small communities of Pelican and Elfin Cove occur here. Pelican, which grew up around commercial fishing, is struggling as recent prices for salmon has dropped. About 3,000 acres of timber have been clearcut, primarily in the 1980s, all in the Port Frederick area. Gold prospecting began shortly after the successful strikes occurred to the south near the town of Chichagof. However, mining yields were marginal compared to the mines on the southern portion of the island. Copper and nickel was successfully mined in Bohemia Basin. Much of the area southwest of Lisianski Inlet is in the West Chichagof-Yakobi Wilderness.

Lisianski Inlet and the town of Pelican (midway up inlet on right side) as viewed from the southeast. The bare granitic ridge in the right foreground typifies much of the higher country in this subsection. The rounded nature of the ridges attests to this area having been overridden by continental ice.

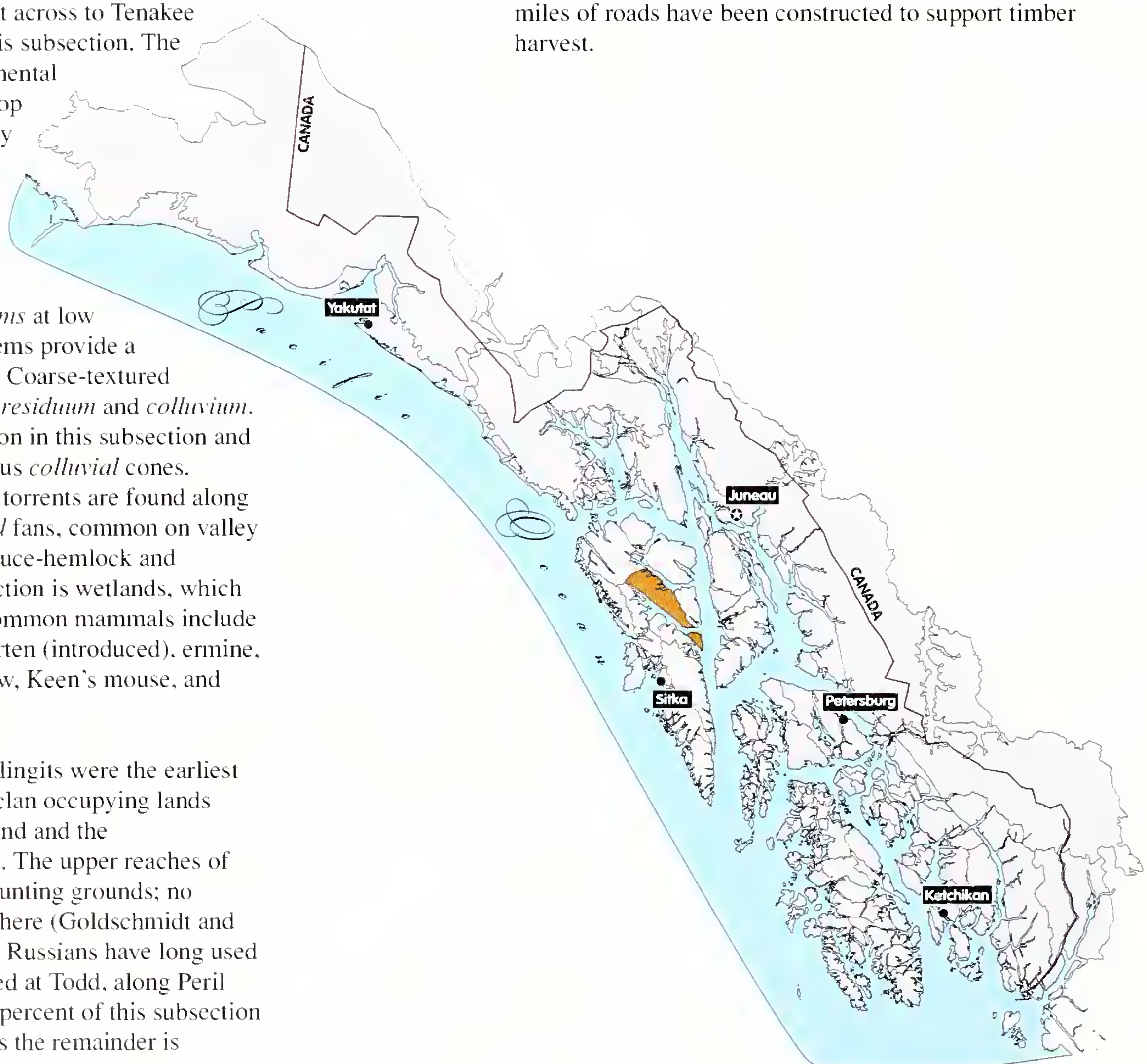
North Chichagof Granitics	Ranked Order					% GRID reporting data
	1st	2nd	3rd	4th	5th	
Landforms	Mountain Slopes (54%)	Mountain Summits (28%)	Lowlands (7%)	Valley Floor (7%)	Hills (4%)	82
Parent Materials	Residuum (32%)	Bedrock (26%)	Colluvium (19%)	Organic Material (14%)	Alluvial (6%)	81
Soils	Spodosols (45%)	Histosols (20%)	Miscellaneous (19%)	Inceptisols (11%)	Entisols (5%)	81
Landcover	Alpine (26%)	Hemlock-Spruce (17%)	Other (11%)	Alder (8%)	Landslides (7%)	100
Productivity	Nonforested (47%)	Nonproductive Forests (27%)	Productive Forests (25%)			100
Site Index	SI 0-40 (64%)	SI 41-60 (17%)	SI 61-80 (13%)	SI >80 (6%)		100
Wetlands	Upland (75%)	Palustrine Forested (9%)	Palustrine Scrub-Shrub (8%)	Palustrine Emergent (7%)		36
Stream Process Groups	High Gradient-Contained (61%)	Floodplain (7%)	Moderate Gradient-Mixed Control (7%)	Alluvial Fan (6%)	Moderate Gradient-Contained (6%)	
Land Use Designations	Mostly Natural Setting (69%)	Wilderness & Monument (19%)	Intensive Development (11%)	Private (1%)		100



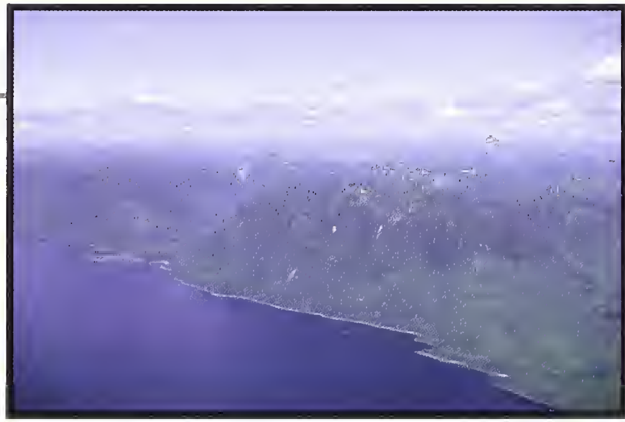




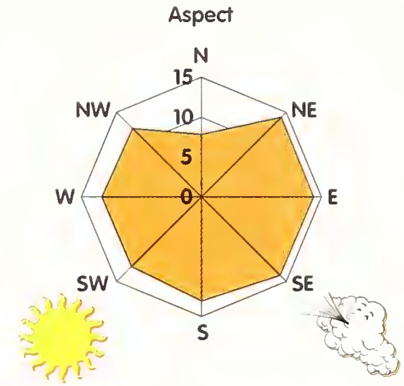
Well-rounded granodiorite and gabbro rocks interspersed with a few slivers of marble occupy this subsection on the northeast shores of Hoonah Sound and Peril Strait across to Tenakee Inlet. Catherine Island also occurs in this subsection. The ridges were heavily scoured from continental glaciers. Alpine barrens and meadows top these rounded ridges and are replaced by brushfields on upper slopes. Numerous deep U-shaped valleys such as Kadashan and Broad Creek dissect the ridges. *High gradient*, incised streams carve the mountains, converting to *moderate gradient and floodplain streams* at low elevations. The broader floodplain systems provide a large area of productive salmon habitat. Coarse-textured mineral soils have developed mainly in *residuum* and *colluvium*. Torrential debris flows are fairly common in this subsection and are partially responsible for the numerous *colluvial* cones. Several large examples of recent debris torrents are found along Peril Strait. *Colluvial* cones and *alluvial* fans, common on valley floors, support productive forests of spruce-hemlock and hemlock. About one-third of this subsection is wetlands, which is fairly typical of Southeast Alaska. Common mammals include brown bear, Sitka black-tailed deer, marten (introduced), ermine, red squirrel (introduced), common shrew, Keen's mouse, and long-tailed vole.



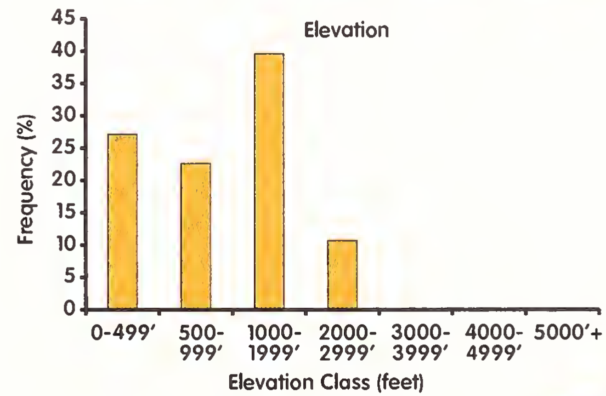
Land-Human Interactions. Angoon Tlingits were the earliest known inhabitants, with the Teikweidí clan occupying lands adjacent to Peril Strait and Hoonah Sound and the Wooshkeetaan clan along Tenakee Inlet. The upper reaches of Hoonah Sound were used as seasonal hunting grounds; no permanent camps or villages occurred there (Goldschmidt and Haas 1998). Angoon Tlingits and, later, Russians have long used the False Island area. A cannery operated at Todd, along Peril Strait, until the 1950s. Today, about 60 percent of this subsection is managed for natural settings, whereas the remainder is managed for resource development. About 11,000 acres have been cut, mostly during the 1960s and 1970s. About 100 miles of roads have been constructed to support timber harvest.



The Peril Strait Granitics and False Island (left center) as viewed from the southeast. The steep-sided mountain slopes of this subsection are very evident in this photograph. Industrial logging began in this area in 1967. This is one of the primary commodity production areas on the Sitka Ranger District.



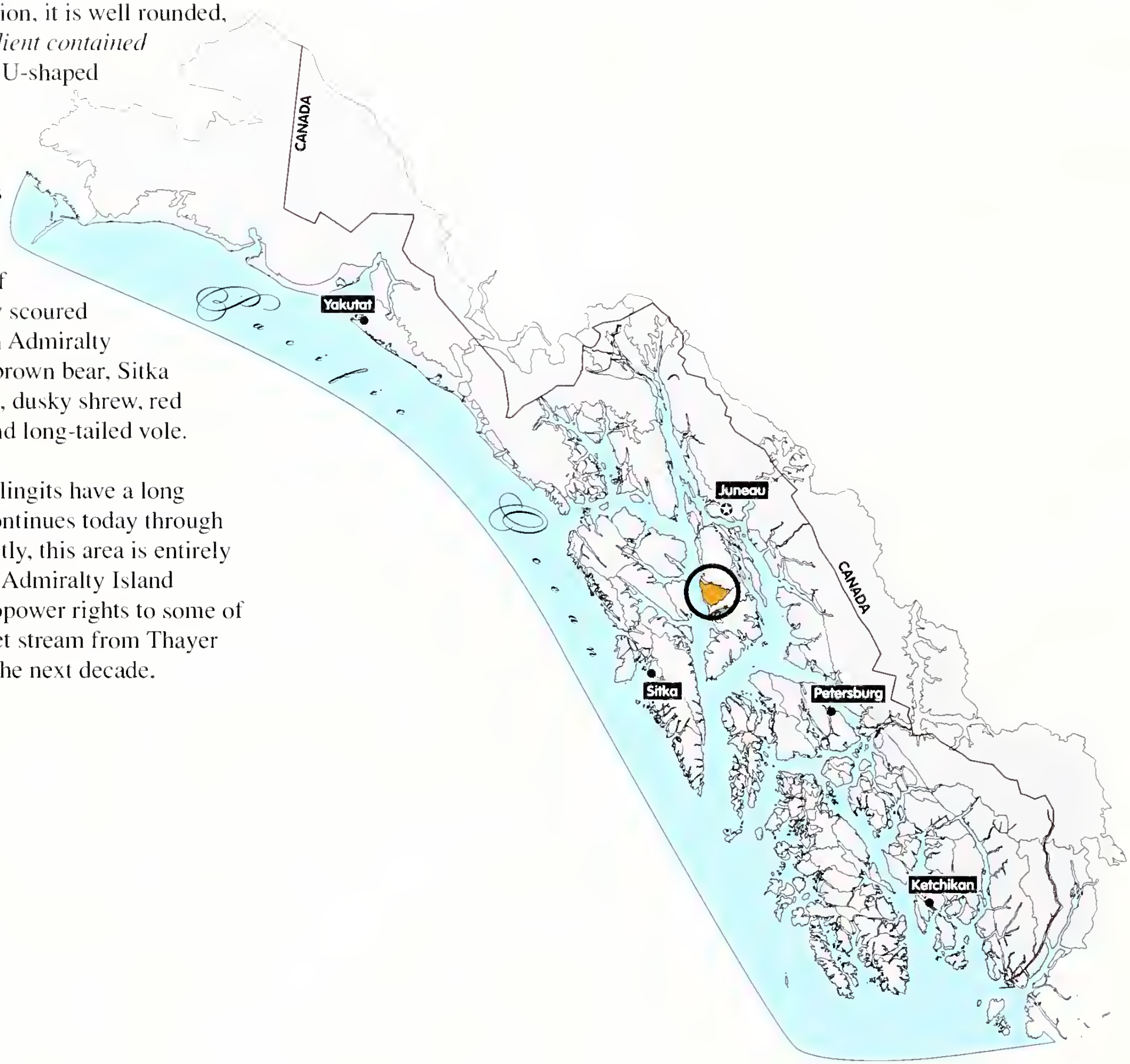
Peril Strait Granitics	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (62%)	Mountain Summits (14%)	Lowlands (10%)	Valley Floor (10%)	Hills (3%)	99
Parent Materials	Residuum (36%)	Colluvium (20%)	Organic Material (15%)	Compact Till (12%)	Bedrock (10%)	98
Soils	Spodosols (58%)	Histosols (26%)	Inceptisols (10%)	Entisols (3%)	Miscellaneous (3%)	98
Landcover	Hemlock-Spruce (28%)	Alpine (14%)	Hemlock (14%)	Alder (10%)	Other (9%)	100
Productivity	Productive Forests (49%)	Nonproductive Forests (29%)	Nonforested (23%)			100
Site Index	SI 0-40 (38%)	SI 41-60 (26%)	SI 61-80 (22%)	SI >80 (14%)		100
Wetlands	Upland (71%)	Palustrine Forested (18%)	Palustrine Emergent (7%)	Palustrine Scrub-Shrub (4%)		100
Stream Process Groups	High Gradient-Contained (59%)	Floodplain (11%)	Alluvial Fan (8%)	Moderate Gradient-Mixed Control (7%)	Moderate Gradient-Contained (7%)	
Land Use Designations	Mostly Natural Setting (62%)	Intensive Development (31%)	Moderate Development (8%)			100

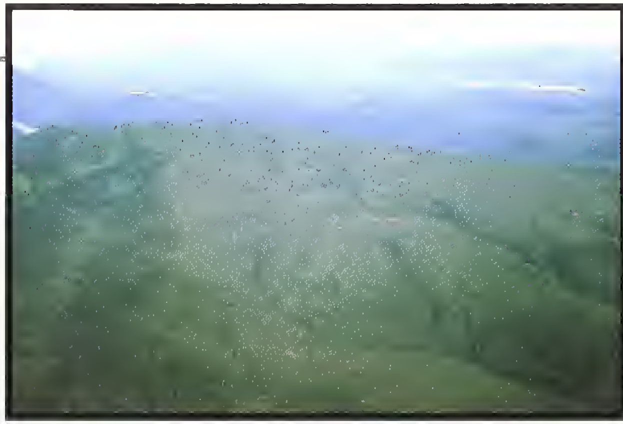


Thayer Lake Granitics

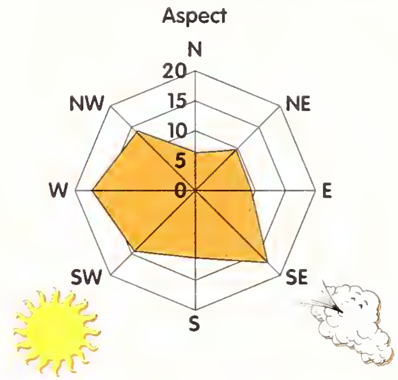
A large granitic *pluton* is located on west-central Admiralty Island along Chatham Strait just north of Mitchell Bay. As with most granitic bodies affected by glaciation, it is well rounded, steep-sided, and dissected by *high-gradient contained streams*. Streams often collect in broad U-shaped valleys before emptying into the sea. Shallow soils over bedrock give rise to low site productivity on the gentle sloping areas of this subsection. Forests of hemlock and hemlock-spruce cover low elevations. Wetlands, about half of them forested, comprise about a third of the subsection. Thayer Lake, a glacially scoured basin lake, is one of the largest lakes on Admiralty Island. Common land animals include brown bear, Sitka black-tailed deer, marten, ermine, mink, dusky shrew, red squirrel, Keen's mouse, and meadow and long-tailed vole.

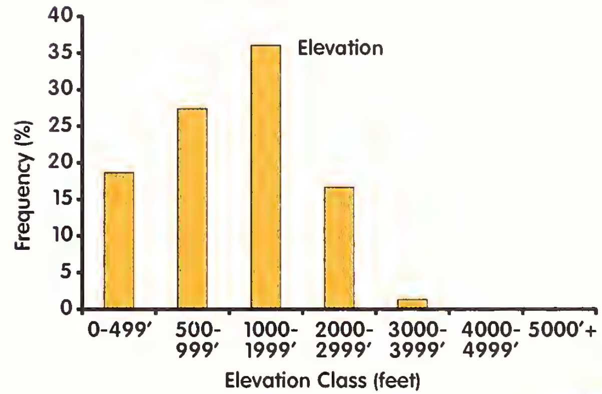
Land-Human Interactions. Angoon Tlingits have a long history with this land—a history that continues today through subsistence hunting and fishing. Currently, this area is entirely within the Kootznoowoo Wilderness of Admiralty Island National Monument. Angoon has hydropower rights to some of the waters from Thayer Creek, the outlet stream from Thayer Lake, and may pursue development in the next decade.





Low-productive wetland forests predominate the wide, gentle slopes (interfluves) between drainages. With increasing elevation, these forested slopes grade into subalpine benchlands with scattered mountain hemlock. This view typifies Thayer Lake Granitics as viewed from the west. Thayer Lake is barely visible on the far left. Mitchell Bay can be seen in the background on the right.





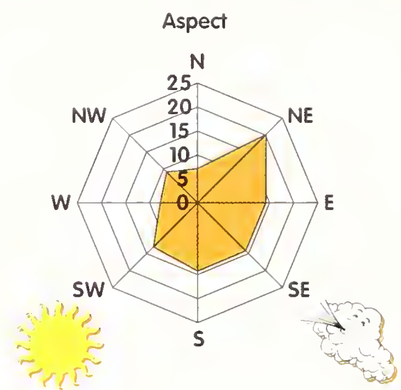
	Ranked Order					
Thayer Lake Granitics	1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms						0
Parent Materials						0
Soils						0
Landcover	Hemlock (41%)	Hemlock-Spruce (24%)	Alpine (13%)	Lodgepole Pine (7%)	Mixed Conifer (6%)	100
Productivity	Productive Forests (65%)	Nonproductive Forests (25%)	Nonforested (10%)			100
Site Index						0
Wetlands	Upland (66%)	Palustrine Forested (16%)	Palustrine Emergent (7%)	Palustrine Scrub-Shrub (6%)	Lacustrine Limnetic (4%)	100
Stream Process Groups	High Gradient-Contained (64%)	Floodplain (9%)	Lake (8%)	Moderate Gradient-Contained (8%)	Palustrine (3%)	
Land Use Designations	Wilderness & Monument (100%)					100

Ushk–Patterson Bay Granitics

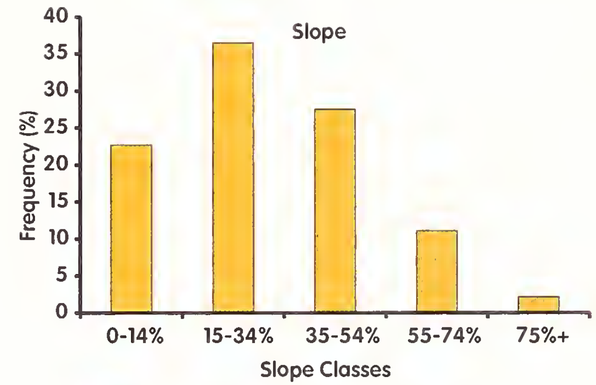
The well-rounded granitic mountains of this subsection hug the shores of Peril Strait from Kakul Narrows north through the South Arm of Hoonah Sound. Topographic relief is lower here than in neighboring subsections, yet the fairly steep, mountain slopes contribute to a rugged topography. Alpine barrens and meadows drape rounded mountaintops, whereas hemlock-spruce forests dominate mountain slopes and valleys. Airborne ash rained on this area during the eruptions of Mount Edgecumbe 9-12,000 years ago. Most of these deposits have washed downslope into valleys. Poorly drained organics or volcanic ash often cap the underlying granite and support vast wetland complexes. There is an extensive collection of floodplains that contribute to productive salmon habitats. Common mammals include brown bear, Sitka black-tailed deer, marten (introduced), ermine, red squirrel (introduced), common shrew, Keen's mouse, and long-tailed vole.

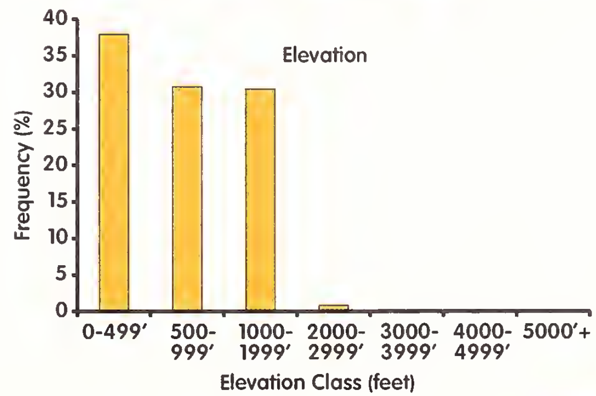
Land-Human Interactions. The Sitka Tlingits gained sustenance from these lands prior to European arrival. This area was principally used as hunting and fishing grounds and smokehouses and camps were scattered along the coast. This area is still an important subsistence area for Sitka people. The U.S. Forest Service manages it for mostly natural settings or wilderness. However, earlier logging did occur in several of the bays (Ushk and Patterson Bays, Poison Cove) prior to changes in land use designation. About 2,000 acres were cut in the 1950s and 1960s. Selective logging was common along the shores for many decades previous to the advent of industrial logging, as evidenced by a sawmill in Suloia Bay in the 1910-1920s.

Hoonah Sound, with Moser Island in the center, as viewed from the northwest. Open ridges and lowlands with higher productive forests on the steeper slopes, which characterize this subsection, can be seen in this view.



Ushk-Patterson Bay Granitics	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (70%)	Valley Floor (13%)	Mountain Summits (8%)	Lowlands (5%)	Hills (2%)	87
Parent Materials	Residuum (25%)	Organic Material (22%)	Colluvium (19%)	Volcanic Ejecta (18%)	Alluvial (9%)	87
Soils	Spodosols (58%)	Histosols (25%)	Inceptisols (12%)	Entisols (3%)	Miscellaneous (3%)	87
Landcover	Hemlock-Spruce (31%)	Other (11%)	Alder (10%)	Hemlock (7%)	Marsh (7%)	100
Productivity	Productive Forests (40%)	Nonproductive Forests (40%)	Nonforested (20%)			100
Site Index	SI 0-40 (50%)	SI 41-60 (20%)	SI 61-80 (18%)	SI >80 (12%)		100
Wetlands	Upland (61%)	Palustrine Forested (17%)	Palustrine Emergent (13%)	Palustrine Scrub-Shrub (8%)	Estuarine Intertidal (1%)	100
Stream Process Groups	High Gradient-Contained (60%)	Floodplain (14%)	Alluvial Fan (9%)	Moderate Gradient-Contained (6%)	Moderate Gradient-Mixed Control (6%)	
Land Use Designations	Mostly Natural Setting (82%)	Wilderness & Monument (18%)				100





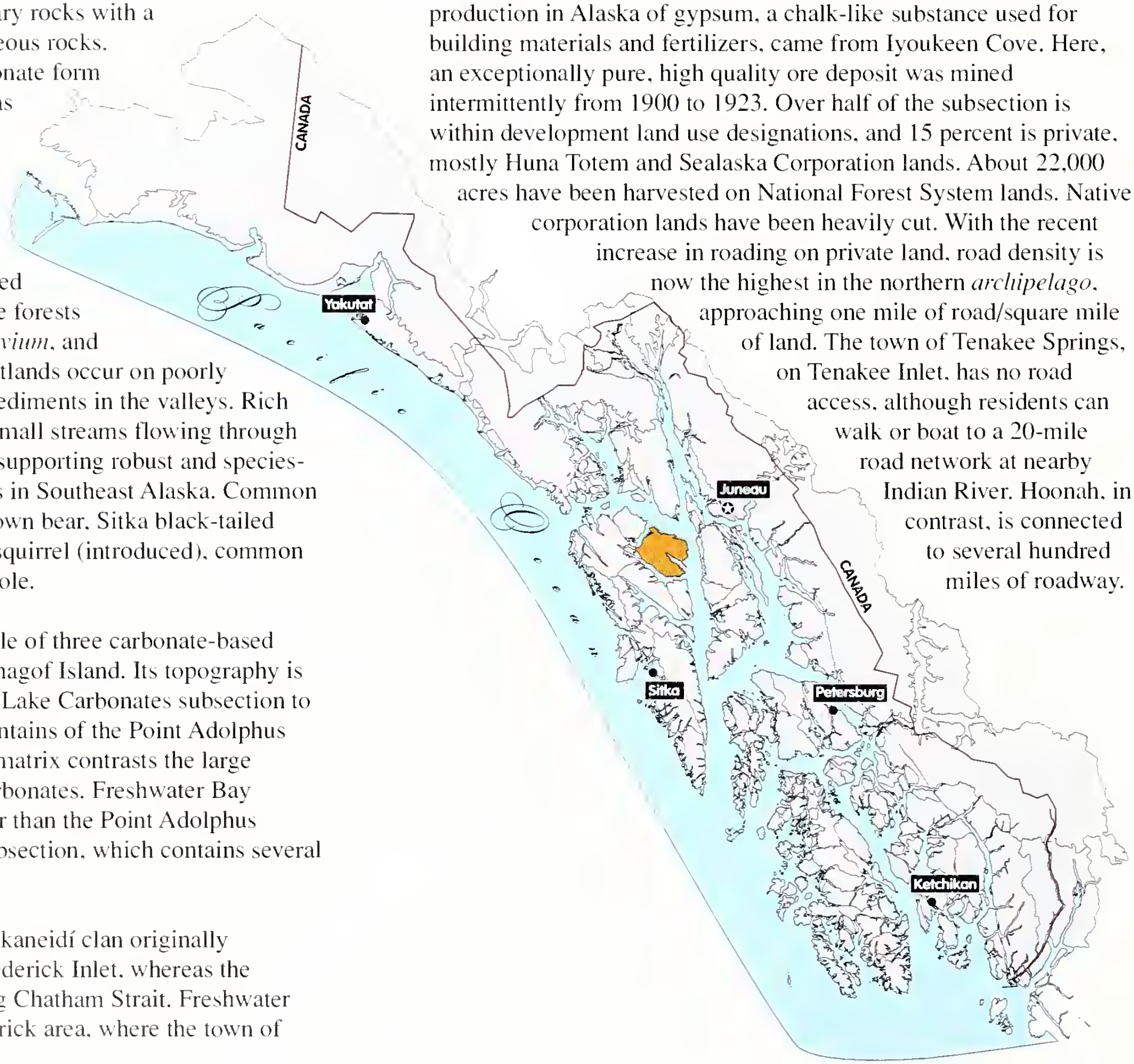
Sedimentary, Carbonates

These areas occur exclusively within the Alexander *terrane* and possess a significant component of carbonate rocks, primarily limestone and marble. Most areas are well drained, with water percolating readily through the underlying carbonate bedrock. Streams flowing across carbonate substrates tend to have channels that are bedrock controlled with scour pools and pockets filled by gravels recruited from glacial deposits in the area (Bryant et al. 1998). Streams originating on and within carbonate outcrops may be intermittent and seasonally dry. Wetlands are infrequent within these areas and are restricted to non-carbonate intrusions or on glacial hardpans overlying carbonate rocks. On areas lacking glacial deposits, fertile soils have developed from sediment impurities left as carbonate rocks dissolve. These soils are also quite shallow and fragile when disturbed. The undulating *karst* topography is a product of the unique weathering processes whereby carbonate rocks actually dissolve rather than breakdown. As a result, these landscapes have large *dolines*, sinkholes, collapsed features, sinking and rising streams, and caves. Areas often show intense *epikarst* development—a matrix of bare rock interspersed with sparsely vegetated, thin soils. Alpine in particular often has significant amounts of bare rock, where soils are too thin to support vegetation. At lower elevations the vegetation is robust and consists of highly productive forests of western hemlock and Sitka spruce. Past harvests have concentrated on these productive lands (Baichtal and Swanston 1996). Because of their composition, carbonate rocks weather at a higher rate than most other rocks (Wissmar et al. 1997). Surface and subsurface waters often have high pH levels, alkalinity, and dissolved solute concentrations that enhance primary aquatic productivity (Wissmar et al. 1997). The unique water chemistry (high alkalinity and calcium) may be significant for the occurrence of various aquatic animals, including snails, mussels, sponges, and certain amphipods (Wissmar et al. 1997). A positive relationship exists between high-alkaline *karst* waters and density of coho salmon (Bryant et al. 1998).


CANADA
Yakutat
Pacific
Ocean
Juneau
CANADA
Sitka
Petersburg
Ketchikan

Freshwater Bay Carbonates

This subsection comprises the eastern peninsula of Chichagof Island between Port Frederick and Tenakee Inlet. The bedrock is a mix of carbonate and noncalcareous sedimentary rocks with a scattering of volcanic and intrusive igneous rocks. Several formations of nearly pure carbonate form impressive ridges and mountains such as Elephant Mountain, near Hoonah, and Seal Mountain. These carbonate mountains have extensive areas of exposed rock containing *epikarst* features such as sinkholes and pits. Between some ridges are broad U-shaped valleys such as Game Creek. Productive forests occur on better-drained *residuum*, *colluvium*, and *alluvium* soils, whereas nonforested wetlands occur on poorly drained glacial *tills* and *glaciomarine* sediments in the valleys. Rich calcareous fens develop at the base of small streams flowing through calcareous *colluvium*. These wetlands, supporting robust and species-rich plant communities, are rare entities in Southeast Alaska. Common mammals of this subsection include brown bear, Sitka black-tailed deer, marten (introduced), ermine, red squirrel (introduced), common shrew, Keen's mouse, and long-tailed vole.

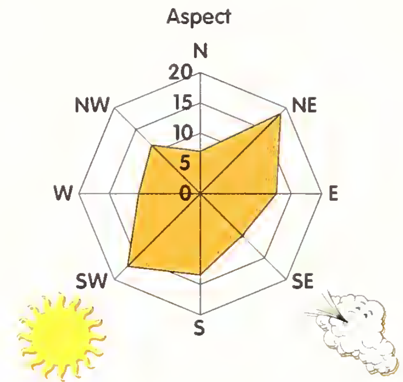


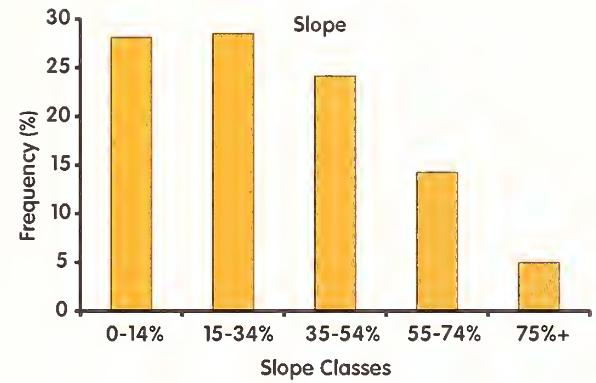
Freshwater Bay Carbonates is the middle of three carbonate-based subsections that comprise eastern Chichagof Island. Its topography is intermediate between the rugged Kook Lake Carbonates subsection to the south and the gently sweeping mountains of the Point Adolphus Carbonates to the north. Its geological matrix contrasts the large *batholith* that forms the Kook Lake Carbonates. Freshwater Bay Carbonates has more surface freshwater than the Point Adolphus subsection, but less than Kook Lake subsection, which contains several *cirque* lakes.

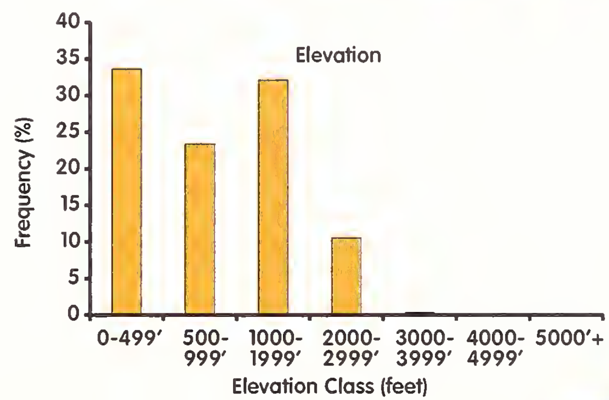
Land-Human Interactions. The Chookaneidí clan originally inhabited lands along Icy Strait and Frederick Inlet, whereas the Wooshkeetan clan occupied lands along Chatham Strait, Freshwater Bay, and Tenakee Inlet. The Port Frederick area, where the town of Hoonah is located, continues to be rich subsistence grounds for hunting, fishing, berry picking, and gardening. The only commercial production in Alaska of gypsum, a chalk-like substance used for building materials and fertilizers, came from Iyoukeen Cove. Here, an exceptionally pure, high quality ore deposit was mined intermittently from 1900 to 1923. Over half of the subsection is within development land use designations, and 15 percent is private, mostly Huna Totem and Sealaska Corporation lands. About 22,000 acres have been harvested on National Forest System lands. Native corporation lands have been heavily cut. With the recent increase in roading on private land, road density is now the highest in the northern *archipelago*, approaching one mile of road/square mile of land. The town of Tenakee Springs, on Tenakee Inlet, has no road access, although residents can walk or boat to a 20-mile road network at nearby Indian River. Hoonah, in contrast, is connected to several hundred miles of roadway.

A view looking to the south past Cannery Point into Port Frederick on Chichagof Island. Game Creek drainage occurs in the background on the right. The gray-colored peak in the background is one of the numerous marble peaks in this subsection. They are almost pure marble, with little soil and vegetation cover at higher elevations. The town of Hoonah is just around the corner of Cannery Point.

Freshwater Bay Carbonates	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (56%)	Lowlands (16%)	Valley Floor (15%)	Mountain Summits (7%)	Hills (5%)	93
Parent Materials	Residuum (34%)	Colluvium (27%)	Organic Material (14%)	Compact Till (13%)	Alluvial (8%)	93
Soils	Spodosols (57%)	Histosols (23%)	Entisols (10%)	Inceptisols (7%)	Miscellaneous (4%)	93
Landcover	Hemlock (26%)	Hemlock-Spruce (24%)	Alpine (13%)	Other (10%)	Alder (8%)	100
Productivity	Productive Forests (58%)	Nonforested (25%)	Nonproductive Forests (17%)			100
Site Index	SI 0-40 (37%)	SI 41-60 (26%)	SI >80 (21%)	SI 61-80 (16%)		100
Wetlands	Upland (74%)	Palustrine Forested (16%)	Palustrine Scrub-Shrub (7%)	Palustrine Emergent (3%)		100
Stream Process Groups	High Gradient-Contained (62%)	Floodplain (10%)	Moderate Gradient-Contained (8%)	Moderate Gradient-Mixed Control (7%)	Alluvial Fan (6%)	
Land Use Designations	Intensive Development (53%)	Mostly Natural Setting (30%)	Private (14%)	Moderate Development (3%)		100



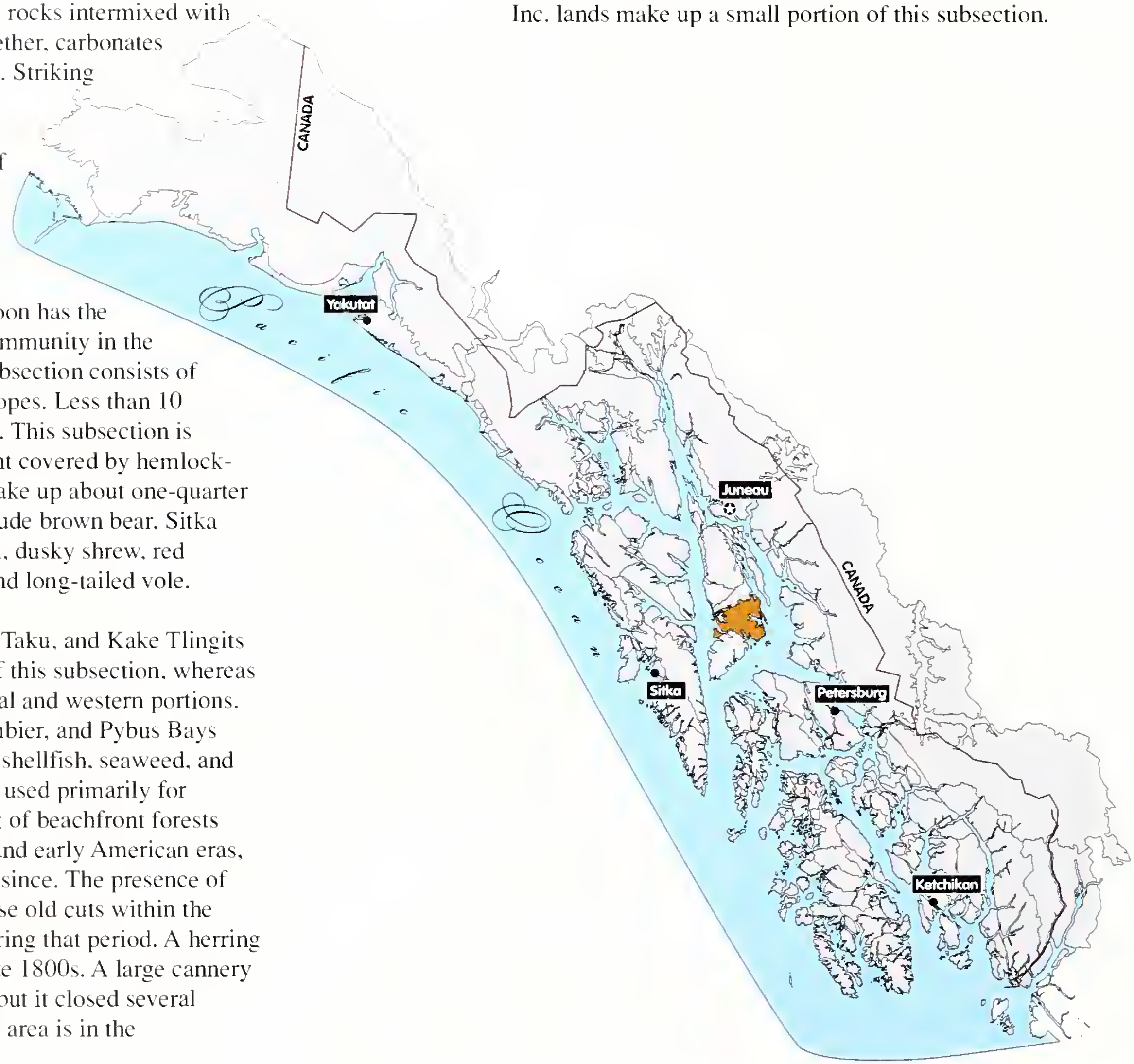




Hood–Gambier Bay Carbonates

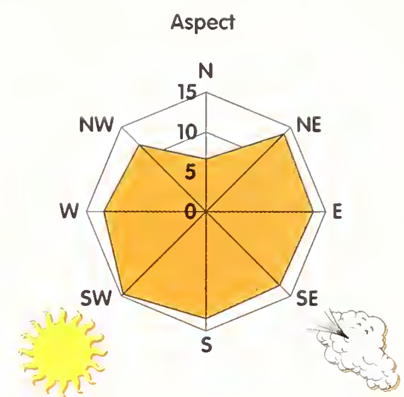
This subsection spans southcentral Admiralty Island from Mitchell Bay and Mole Harbor south to Hood and Pybus Bay. The bedrock is a matrix of sedimentary rocks intermixed with limestone and marble cap rocks. Altogether, carbonates make up roughly 20 percent of the area. Striking white cliffs often fringe the carbonate carapaces that form ridges and peaks. Here, at high elevations, the majority of sinkholes and other *karst* features occur. Although the peaks are fairly tall, most have been well rounded by regional glaciation. This is one of the "drier" areas in Southeast Alaska. Angoon has the lowest average rainfall of any island community in the *archipelago*. Over 50 percent of this subsection consists of moderate to steep forested mountain slopes. Less than 10 percent of the area is considered alpine. This subsection is densely forested, with almost 70 percent covered by hemlock-spruce or hemlock forests. Wetlands make up about one-quarter of the area. Common land animals include brown bear, Sitka black-tailed deer, marten, ermine, mink, dusky shrew, red squirrel, Keen's mouse, and meadow and long-tailed vole.

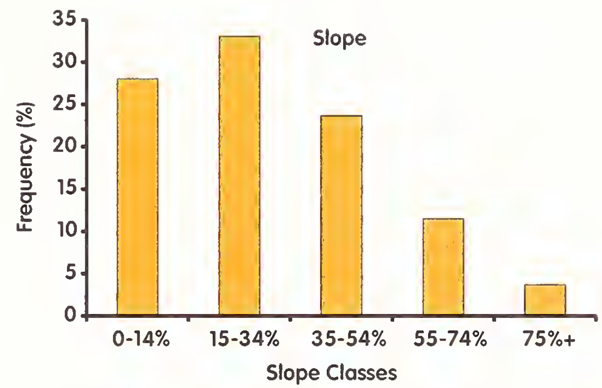
Land-Human Interactions. The Auk, Taku, and Kake Tlingits formerly traversed the eastern shores of this subsection, whereas the Angoon Tlingits occupied the central and western portions. The rich resources found at Hood, Gambier, and Pybus Bays provided these people with amble fish, shellfish, seaweed, and marine mammals. The mountains were used primarily for hunting and trapping. Selective logging of beachfront forests was very common during the Russian and early American eras, but no large-scale cutting has occurred since. The presence of soil charcoal indicates that some of these old cuts within the Mitchell Bay area were also burned during that period. A herring oil plant operated at Killisnoo in the late 1800s. A large cannery operated at Hood Bay for many years, but it closed several decades ago. Today, the majority of the area is in the Kootznoowoo Wilderness of Admiralty Island National Monument. The town of Angoon and adjacent Kootznoowoo Inc. lands make up a small portion of this subsection.

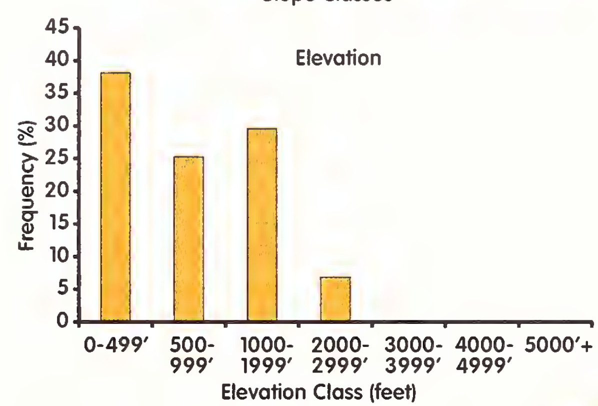


A view looking east up into Kanalku Bay and Kanalku Lake. The fine-textured forests in the foreground represent younger stands originating from a past windstorm. The forested slopes to the right of Kanalku Lake and many in the background are underlain by carbonate. Some of the colluvial and alluvial fans on carbonate harbor stands of spruce over 220 feet tall! Kanalku Creek is an important subsistence sockeye fishery for the people of Angoon.

Hood-Gambier Bay Carbonates	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms						0
Parent Materials						0
Soils						0
Landcover	Hemlock-Spruce (37%)	Hemlock (30%)	Lodgepole Pine (9%)	Landslides (8%)	Alpine (6%)	100
Productivity	Productive Forests (68%)	Nonproductive Forests (23%)	Nonforested (9%)			100
Site Index						0
Wetlands	Upland (74%)	Palustrine Forested (17%)	Palustrine Emergent (6%)	Palustrine Scrub-Shrub (3%)		100
Stream Process Groups	High Gradient-Contained (68%)	Floodplain (10%)	Moderate Gradient-Mixed Control (8%)	Moderate Gradient-Contained (6%)	Estuary (3%)	
Land Use Designations	Wilderness & Monument (98%)	Private (2%)				100







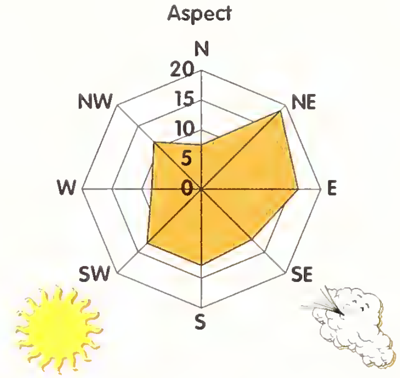
Kook Lake Carbonates

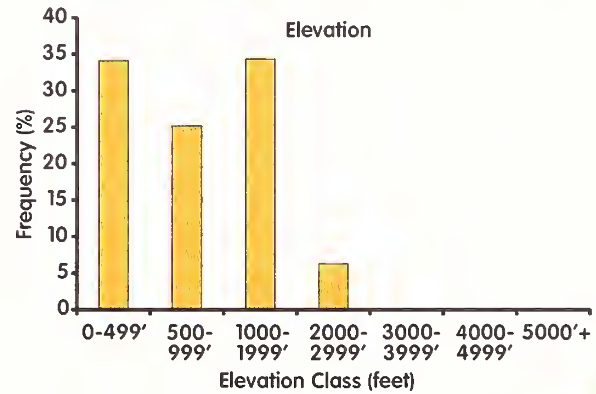
This subsection forms the southeast corner of Chichagof Island along Chatham Strait between Tenakee Inlet and Sitkoh Bay. Intrusive igneous rocks and locally metamorphosed rocks associated with these *plutons* comprise much of this area. Limestone and marble make up a smaller amount of area, but have a large impact on forest and stream productivity. This is the southernmost of three carbonate subsections that form the eastern side of Chichagof Island. The Kook Lake Carbonates contrasts the other two carbonate subsections by having the most rugged topography, more area in mountain summits and freshwater lakes, and more granitic and fewer sedimentary rocks. The coastline along Chatham Strait is almost pure marble weathered into thousands of small sharp spires. Trap Mountain, made of carbonates and about 3,900 feet tall, was a *nunatak* that rose above the continental ice sheet that inundated the rest of this subsection. *Spodosols* make up about two-thirds of the soils, as is common for much of Southeast Alaska. Productive forests are fairly common, especially on carbonate bedrock and *colluvial* and *alluvial* surfaces. Wetlands make up only 20 percent of this subsection. Kook Lake, Basket Lake, and several unnamed lakes sit in small *cirque* basins. Most of these have cave systems associated with their outlets. A superlative arch occurs just up from saltwater near Basket Bay. Sockeye swim through a cave system to spawn in Kook Lake. Common mammals include brown bear, Sitka black-tailed deer, marten (introduced), ermine, red squirrel (introduced), common shrew, Keen's mouse, and long-tailed vole.

Land-Human Interactions. The Angoon Tlingits formerly resided on these lands. The tribal house of the Kak'w.weidí clan was located in Basket Bay. Kook Lake continues to have an important subsistence run of sockeye salmon. Today, the U.S. Forest Service manages about 60 percent of this subsection for resource development. Two congressionally designated roadless areas encompass Trap Bay and a portion of the Kadashan watershed. Logging started in earnest with the salvaging of several thousand acres that blew down in 1968, and has continued since then. Approximately 12,000 acres have been harvested to date, encompassing about 17 percent of the productive forest. To support this activity, a road network averaging about 0.8 road miles/square mile of land has been built. This is one of the highest road densities on the north end of the Tongass National Forest. In 1999, several thousand acres along the shore of Chatham Strait were transferred to the Sealaska Corporation.

A southwest view of Chichagof Island from Chatham Strait. Trap Bay is on the right side of the photo. The brilliant Trap Mountain, a nearly pure carbonate peak, is in the background. Timber harvest is common on the highly productive soils underlain by carbonate bedrock.

Kook Lake Carbonates	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (60%)	Valley Floor (15%)	Lowlands (14%)	Mountain Summits (8%)	Hills (2%)	99
Parent Materials	Residuum (41%)	Colluvium (27%)	Compact Till (10%)	Alluvial (10%)	Organic Material (9%)	99
Soils	Spodosols (67%)	Histosols (16%)	Inceptisols (10%)	Entisols (5%)	Miscellaneous (2%)	99
Landcover	Hemlock-Spruce (39%)	Other (15%)	Hemlock (15%)	Alpine (7%)	Landslides (5%)	100
Productivity	Productive Forests (66%)	Nonproductive Forests (19%)	Nonforested (15%)			100
Site Index	SI >80 (29%)	SI 0-40 (24%)	SI 61-80 (23%)	SI 41-60 (23%)		100
Wetlands	Upland (80%)	Palustrine Forested (13%)	Palustrine Emergent (5%)	Lacustrine Limnetic (1%)	Palustrine Scrub-Shrub (1%)	100
Stream Process Groups	High Gradient-Contained (54%)	Floodplain (15%)	Alluvial Fan (10%)	Moderate Gradient-Mixed Control (7%)	Moderate Gradient-Contained (5%)	
Land Use Designations	Intensive Development (55%)	Mostly Natural Setting (39%)	Moderate Development (6%)			100

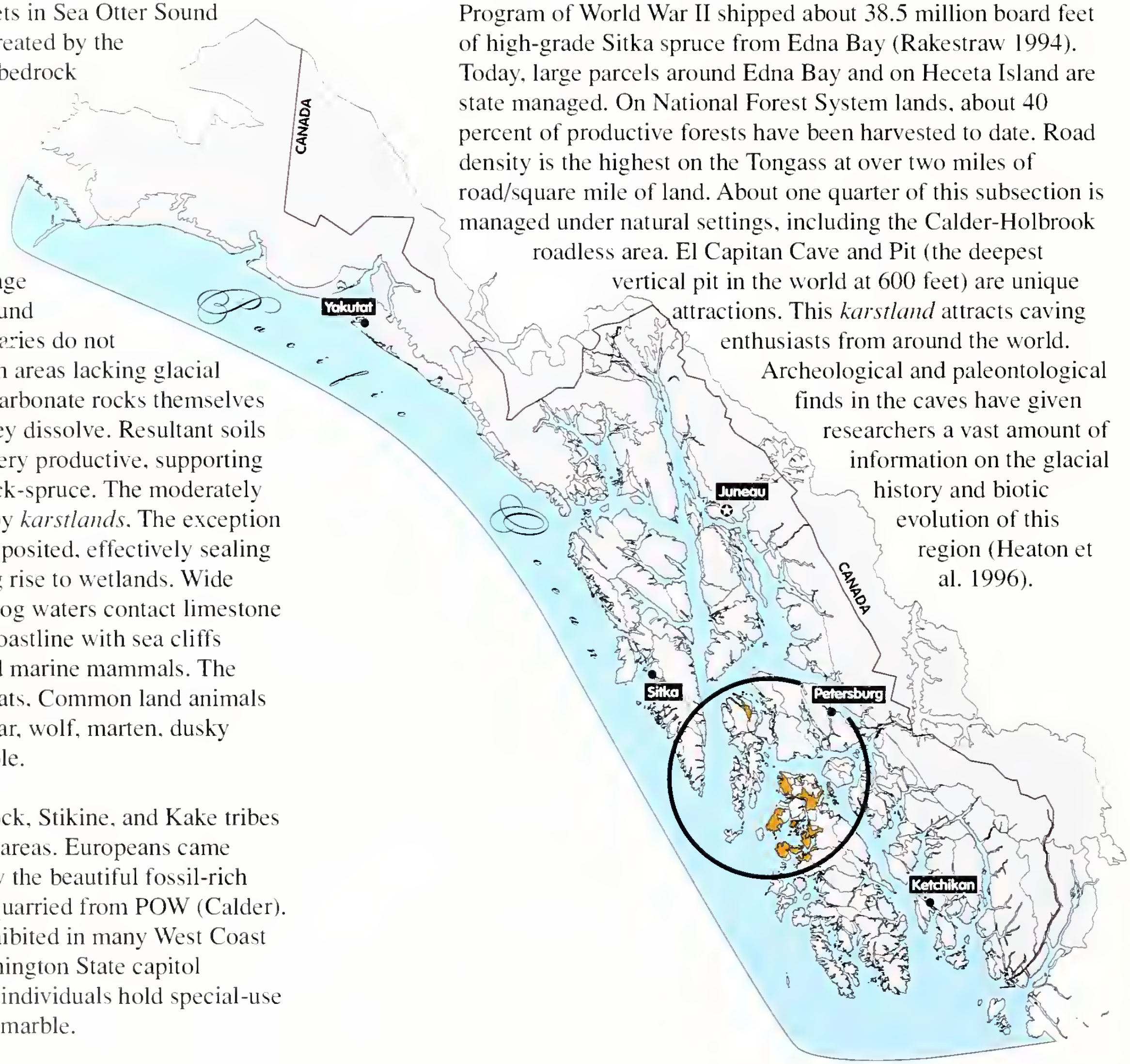




North Prince of Wales–Kuiu Carbonates

A well-developed *karst* landscape exists on the northern portions of Prince of Wales and Kuiu Islands, on Kosciusko, Heceta, Tuxekan, and Marble Islands, and on scattered islets in Sea Otter Sound and near Saginaw Bay. *Karstlands* are created by the unique physical properties of carbonate bedrock (limestone and marble) that cause it to dissolve rather than erode like conventional rocks. As a result, surfaces undulate irregularly and possess unique topographic oddities including cone-shaped pits, vertical shafts, cliffs, and caves. Likewise, a unique internal drainage system of pipes, fractures, and underground conduits exists, so that watershed boundaries do not necessarily follow surface topography. In areas lacking glacial overburden, soils develop not from the carbonate rocks themselves but from the impurities left behind as they dissolve. Resultant soils are often shallow but well drained and very productive, supporting extensive forests of hemlock and hemlock-spruce. The moderately high precipitation is quickly processed by *karstlands*. The exception is where compact glacial *till* has been deposited, effectively sealing the otherwise porous bedrock and giving rise to wetlands. Wide vertical shafts often form where acidic bog waters contact limestone (Conner and O'Haire 1988). A rugged coastline with sea cliffs supports an abundance of shorebirds and marine mammals. The area's many caves are ideal habitat for bats. Common land animals include Sitka black-tailed deer, black bear, wolf, marten, dusky shrew, Keen's mouse, and long-tailed vole.

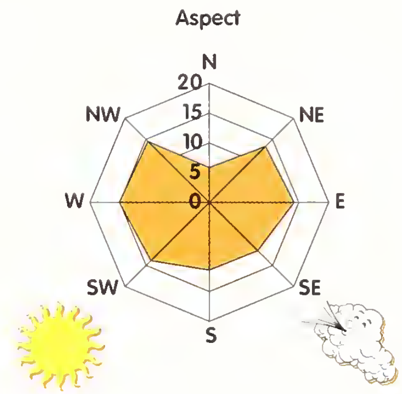
Land-Human Interactions. The Klawock, Stikine, and Kake tribes of the Tlingit originally resided in these areas. Europeans came during the early 20th century attracted by the beautiful fossil-rich marble rocks. Various types of marble, quarried from POW (Calder), Orr, Marble, and Hecata Islands, are exhibited in many West Coast buildings including the Alaska and Washington State capitol buildings (Roppel 1991). Today, private individuals hold special-use permits for commercial development of marble.

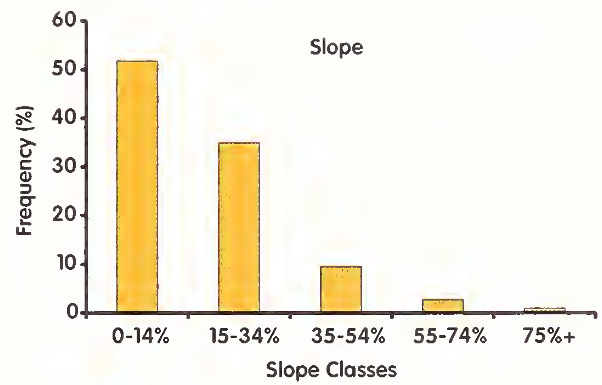


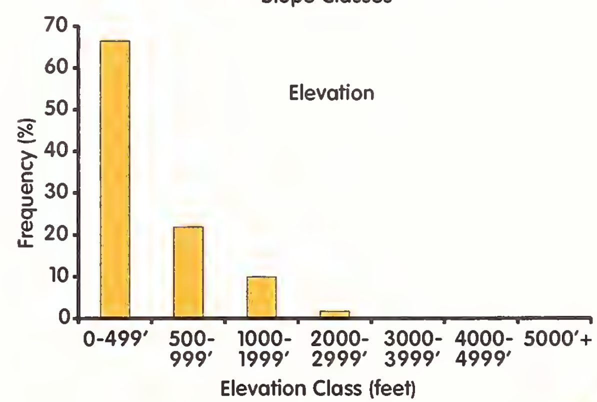
Extensive cutting of highly productive forests since the 1940s has left large areas of second growth. The Alaska Spruce Log Program of World War II shipped about 38.5 million board feet of high-grade Sitka spruce from Edna Bay (Rakestraw 1994). Today, large parcels around Edna Bay and on Heceta Island are state managed. On National Forest System lands, about 40 percent of productive forests have been harvested to date. Road density is the highest on the Tongass at over two miles of road/square mile of land. About one quarter of this subsection is managed under natural settings, including the Calder-Holbrook roadless area. El Capitan Cave and Pit (the deepest vertical pit in the world at 600 feet) are unique attractions. This *karstland* attracts caving enthusiasts from around the world. Archeological and paleontological finds in the caves have given researchers a vast amount of information on the glacial history and biotic evolution of this region (Heaton et al. 1996).

The rugged shoreline of Heceta Island, one of the outer islands of the Alexander Archipelago, illustrates the well-developed karst landscape of this subsection. Heceta Island's western shore rises steeply forming sea-cliffs. The nearly level, glacially scraped terrace above contains abundant karst features. Bald Mountain, seen in the background, marks the edge of the ice sheet that flowed across this region. The well-drained carbonaceous soils produce extensive forests of productive hemlock and spruce.

North POW-Kuiu Carbonates	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Hills (60%)	Mountain Slopes (13%)	Valley Floor (13%)	Lowlands (8%)	Mountain Summits (6%)	25
Parent Materials	Organic Material (60%)	Residuum (19%)	Colluvium (6%)	Bedrock (6%)	Compact Till (5%)	23
Soils	Histosols (63%)	Spodosols (29%)	Miscellaneous (6%)	Entisols (2%)	Inceptisols (1%)	25
Landcover	Hemlock-Spruce (30%)	Hemlock (30%)	Other (22%)	Brush (5%)	Mixed Conifer (5%)	100
Productivity	Productive Forests (81%)	Nonproductive Forests (11%)	Nonforested (8%)			100
Site Index	SI >80 (63%)	SI 41-60 (19%)	SI 0-40 (11%)	SI 61-80 (8%)		76
Wetlands	Upland (80%)	Palustrine Forested (14%)	Palustrine Emergent (3%)	Lacustrine Limnetic (1%)	Estuarine Intertidal (1%)	100
Stream Process Groups	High Gradient-Contained (63%)	Moderate Gradient-Mixed Control (10%)	Moderate Gradient-Contained (7%)	Floodplain (6%)	Palustrine (5%)	
Land Use Designations	Intensive Development (55%)	Mostly Natural Setting (28%)	Private (10%)	Moderate Development (7%)		100





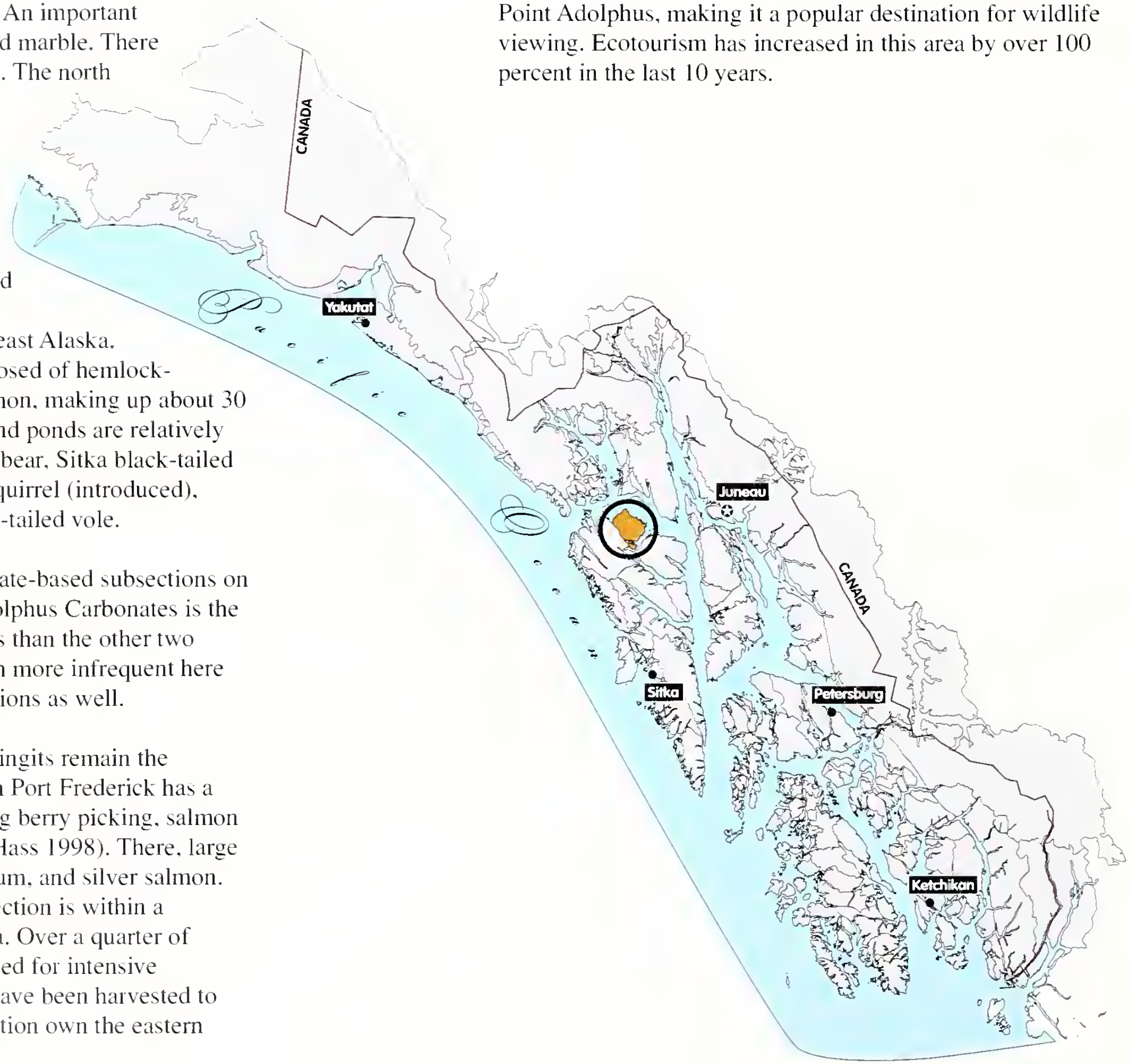


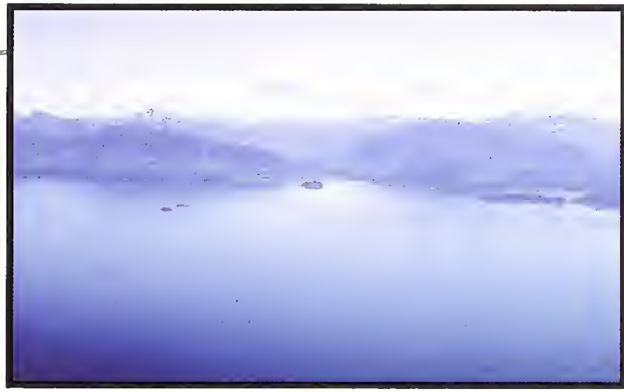
Point Adolphus Carbonates

This subsection occupies the northeastern corner of Chichagof Island bordered by Icy Strait and Port Frederick. The bedrock consists primarily of sedimentary rocks. An important component is composed of limestone and marble. There are also some volcanics such as andesite. The north side of this subsection, particularly, is actively uplifting following the recent retreat of glaciers from adjacent Glacier Bay (*isostatic rebound*) and local *tectonism*. As a result, young *supratidal* meadows and beachfront forests line much of its coastline. Neka Bay and Mud Bay are estuaries having extensive tidal meadows—rather rare features in Southeast Alaska. Most of the productive forests are composed of hemlock-spruce and hemlock. Wetlands are common, making up about 30 percent of this subsection, while lakes and ponds are relatively rare. Common mammals include brown bear, Sitka black-tailed deer, marten (introduced), ermine, red squirrel (introduced), common shrew, Keen's mouse, and long-tailed vole.

This is the northernmost of three carbonate-based subsections on eastern Chichagof Island. The Point Adolphus Carbonates is the most rolling and has more hill landforms than the other two subsections. Freshwater bodies are much more infrequent here compared to the other carbonate subsections as well.

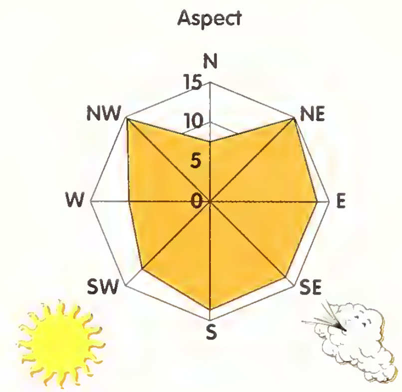
Land-Human Interactions. Hoonah Tlingits remain the principal users of this area. Neka Bay on Port Frederick has a long history of subsistence use, including berry picking, salmon fishing, and hunting (Goldschmidt and Hass 1998). There, large Native smokehouses processed pink, chum, and silver salmon. Today, the northern portion of this subsection is within a congressionally designated roadless area. Over a quarter of National Forest System lands are managed for intensive development, where about 2,400 acres have been harvested to date. Huna Totem and Sealaska Corporation own the eastern one-quarter of the subsection where thousands of acres have been harvested in the 1990s. Whales often congregate near Point Adolphus, making it a popular destination for wildlife viewing. Ecotourism has increased in this area by over 100 percent in the last 10 years.

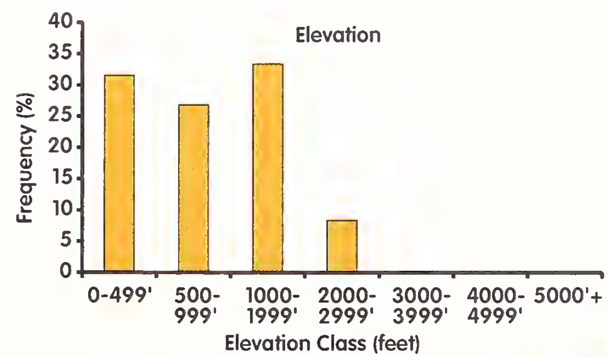




Relatively low-relief mountains surround Gallagher Creek drainage as viewed from the east. This subsection has the most subdued topography of the three carbonate subsections on eastern Chichagof Island. Forests blanket a good portion of these hills and rounded mountains.

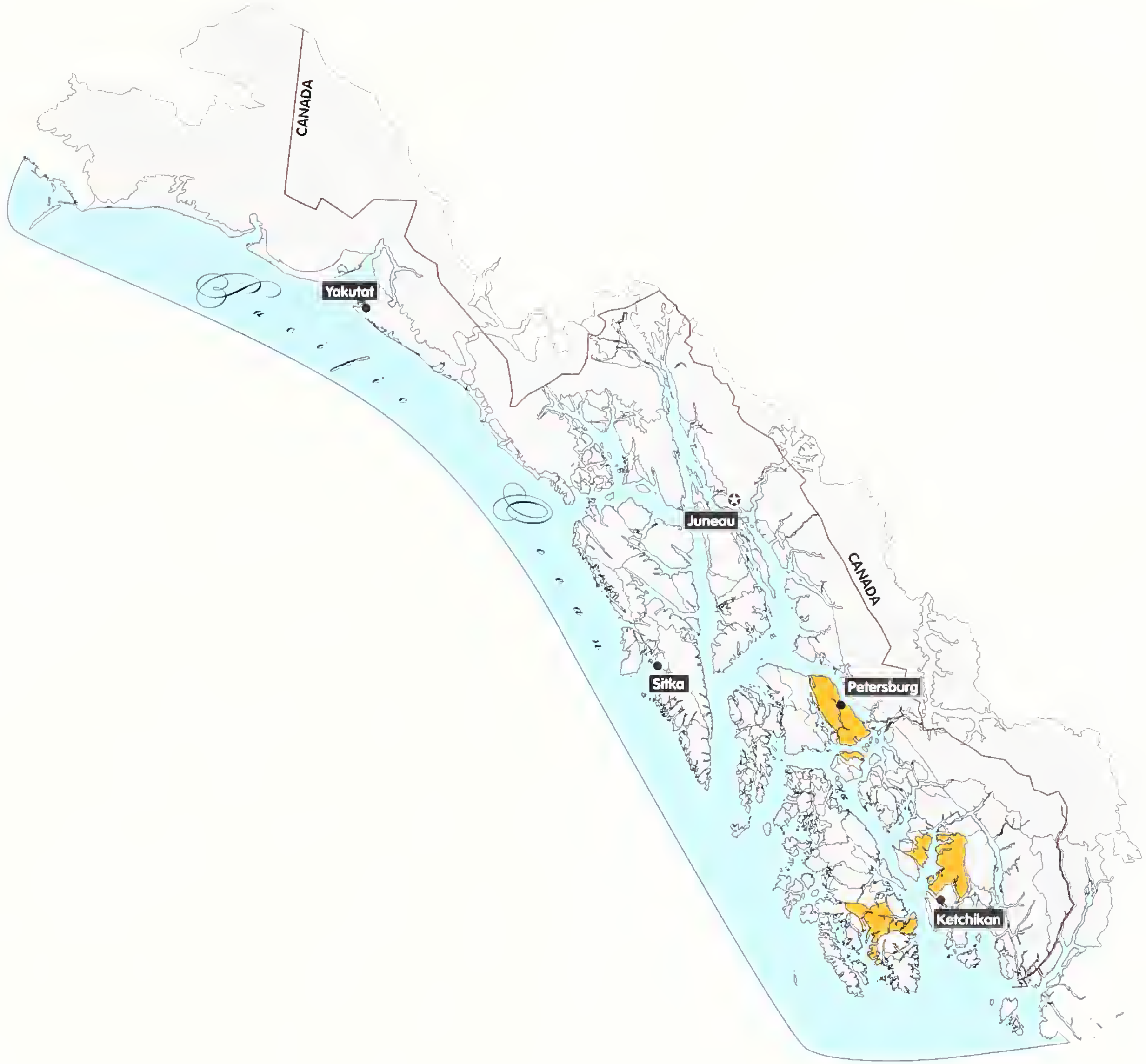
Point Adolphus Carbonates	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (62%)	Valley Floor (15%)	Lowlands (13%)	Mountain Summits (5%)	Hills (4%)	73
Parent Materials	Residuum (39%)	Colluvium (29%)	Organic Material (15%)	Alluvial (10%)	Compact Till (6%)	73
Soils	Spodosols (61%)	Histosols (19%)	Entisols (10%)	Inceptisols (9%)	Miscellaneous (1%)	73
Landcover	Hemlock-Spruce (39%)	Hemlock (13%)	Alpine (9%)	Brush (8%)	Alder (6%)	100
Productivity	Productive Forests (57%)	Nonforested (23%)	Nonproductive Forests (20%)			100
Site Index	SI 0-40 (53%)	SI 41-60 (19%)	SI 61-80 (12%)	SI >80 (16%)		100
Wetlands	Upland (70%)	Palustrine Forested (16%)	Palustrine Scrub-Shrub (11%)	Palustrine Emergent (2%)		100
Stream Process Groups	High Gradient-Contained (51%)	Floodplain (14%)	Moderate Gradient-Contained (10%)	Estuary (6%)	Alluvial Fan (5%)	
Land Use Designations	Mostly Natural Setting (48%)	Intensive Development (27%)	Private (25%)			100





Metasedimentary

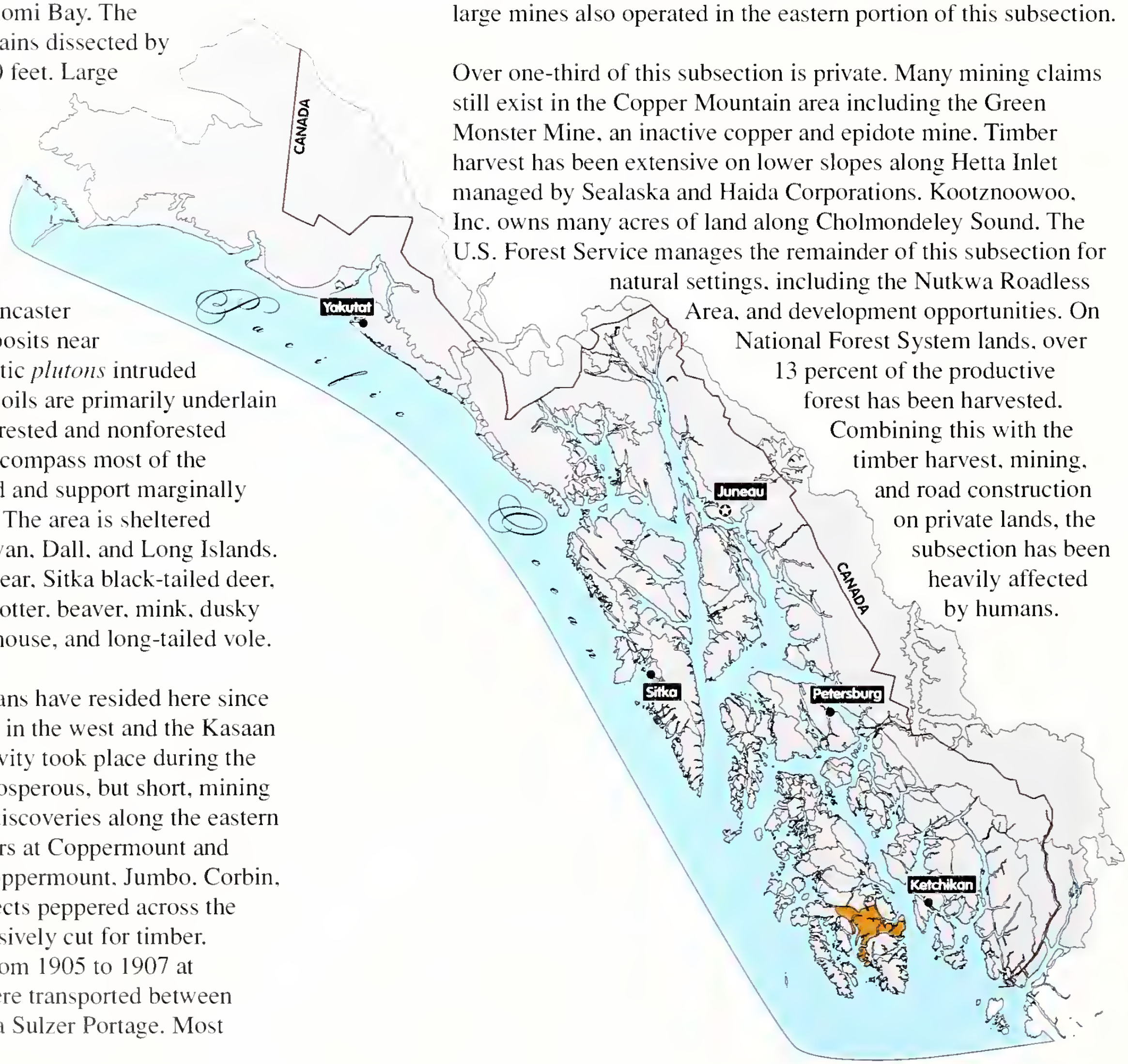
Rock types underlying these areas are moderately to highly *deformed* and *metamorphosed* fine sandstone (*graywacke*), mudstone, volcanic rocks of basaltic and/or andesitic composition, and minor amounts of conglomerate and limestone. These have been metamorphosed to greenschist, greenstone, schist, phyllite, slate, quartzite, amphibolite, and marble. Glacial scour and drainage networks often reflect the geologic structure and bedding orientations. Soils reflect the original texture of the bedrock. For example, fine-textured soils result from greenstone and slate, whereas coarse-textured soils form from schists, amphibolite, and quartzite. Landslides often initiate along steep slopes at the soil-bedrock contact. A mixture of vegetation types exists across the area as a function of drainage, aspect and elevation.


CANADA
Yakutat
Pacific Ocean
Juneau
CANADA
Sitka
Petersburg
Ketchikan

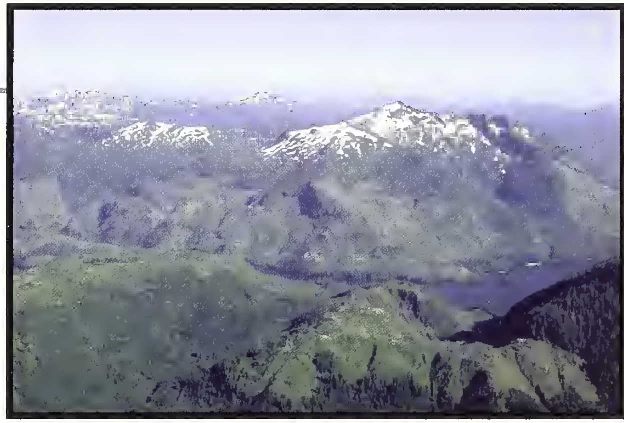
Hetta Inlet Metasediments

This subsection, centered on Sulzer Portage, encompasses south-central Prince of Wales Island from Tracadero Bay south to Kassa Inlet and east to McKenzie Inlet and Dolomi Bay. The topography consists of very steep mountains dissected by deep *fjords*. Elevations range up to 3,000 feet. Large valleys, together with *cirque* basin lakes, occupy the heads of inlets and bays. The bedrock is highly to slightly metamorphosed sedimentary and volcanic rock. The fine-grained texture of these rocks coupled with steep topography trigger frequent landslides. Some carbonate rocks occur between Lancaster Cove and Dolomi Bay. Large copper deposits near Hetta Inlet formed in skarns where granitic *plutons* intruded limestone (Conner and O'Haire 1988). Soils are primarily underlain by *till* at lower elevations and support forested and nonforested wetlands. At higher elevations, which encompass most of the subsection, soils are more poorly drained and support marginally commercial forests and alpine wetlands. The area is sheltered somewhat from Pacific storms by Sukkwan, Dall, and Long Islands. Common land mammals include black bear, Sitka black-tailed deer, marten (introduced), wolf, ermine, river otter, beaver, mink, dusky shrew, northern flying squirrel, Keen's mouse, and long-tailed vole.

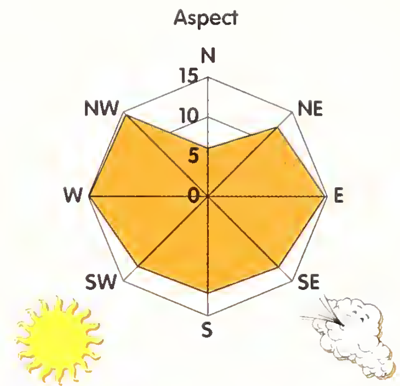
Land-Human Interactions. Haida Indians have resided here since the early 1700s, with the Hydaburg tribe in the west and the Kasaan tribe in the east. A swarm of mining activity took place during the late 19th and early 20th centuries. The prosperous, but short, mining history began in 1897 with rich copper discoveries along the eastern shores of Hetta Inlet. Here, supply centers at Coppermount and Sulzer quickly sprang up to serve the Coppermount, Jumbo, Corbin, and Copper City mines and small prospects peppered across the mountainsides. Local forests were extensively cut for timber. Alaska's first copper smelter operated from 1905 to 1907 at Coppermount. Supplies and products were transported between Hetta Inlet and Cholmondeley Sound via Sulzer Portage. Most mining ceased by the 1920s with the Jumbo Mine generating about $1.8 million worth of ore (Berg and Cobbs 1967). Several large mines also operated in the eastern portion of this subsection.



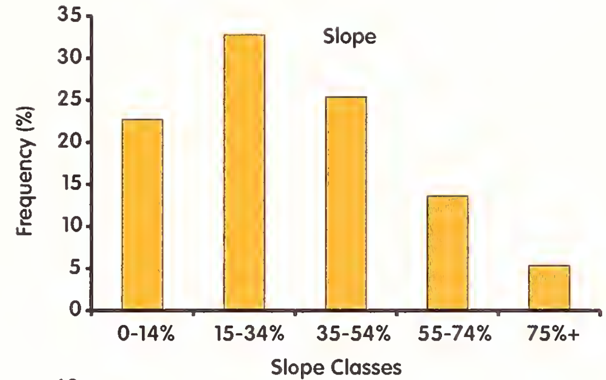
Over one-third of this subsection is private. Many mining claims still exist in the Copper Mountain area including the Green Monster Mine, an inactive copper and epidote mine. Timber harvest has been extensive on lower slopes along Hetta Inlet managed by Sealaska and Haida Corporations. Kootznoowoo, Inc. owns many acres of land along Cholmondeley Sound. The U.S. Forest Service manages the remainder of this subsection for natural settings, including the Nutkwa Roadless Area, and development opportunities. On National Forest System lands, over 13 percent of the productive forest has been harvested. Combining this with the timber harvest, mining, and road construction on private lands, the subsection has been heavily affected by humans.

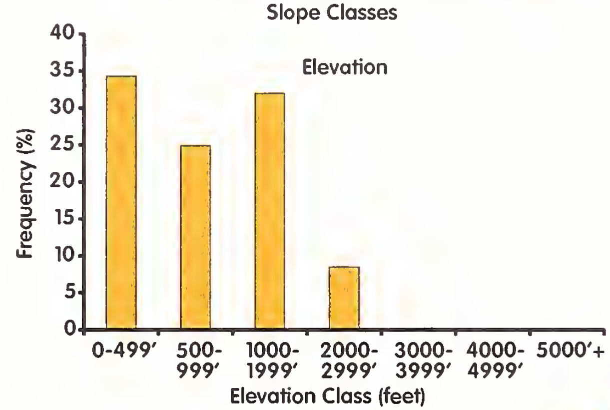


The steep and rugged landscape is represented by snow-capped Mount Jumbo and Copper Mountain on south-central Prince of Wales Island. The exposed metamorphosed sedimentary and volcanic rocks are rounded and support marginally commercial forests and alpine wetlands. The area surrounding Hetta Inlet (center) has a long mining history and mountain slopes have been extensively cut.



Hetta Inlet Metasediments	Ranked Order					% GRID reporting data
	1st	2nd	3rd	4th	5th	
Landforms	Mountain Slopes (64%)	Mountain Summits (19%)	Hills (8%)	Valley Floor (8%)	Coastal (1%)	60
Parent Materials	Colluvium (45%)	Organic Material (17%)	Residuum (17%)	Compact Till (15%)	Bedrock (3%)	56
Soils	Spodosols (67%)	Histosols (21%)	Inceptisols (7%)	Miscellaneous (3%)	Entisols (2%)	60
Landcover	Hemlock-Spruce (24%)	Rock (20%)	Hemlock (18%)	Mixed Conifer (8%)	Alpine (8%)	100
Productivity	Productive Forests (47%)	Nonforested (31%)	Nonproductive Forests (21%)			100
Site Index	SI >80 (47%)	SI 61-80 (21%)	SI 41-60 (19%)	SI 0-40 (13%)		93
Wetlands	Upland (74%)	Palustrine Forested (14%)	Palustrine Scrub-Shrub (5%)	Palustrine Emergent (3%)	Lacustrine Limnetic (2%)	100
Stream Process Groups	High Gradient-Contained (75%)	Moderate Gradient-Mixed Control (6%)	Lake (5%)	Floodplain (5%)	Moderate Gradient-Contained (4%)	
Land Use Designations	Private (36%)	Mostly Natural Setting (31%)	Intensive Development (24%)	Moderate Development (8%)	Wilderness & Monument (1%)	100

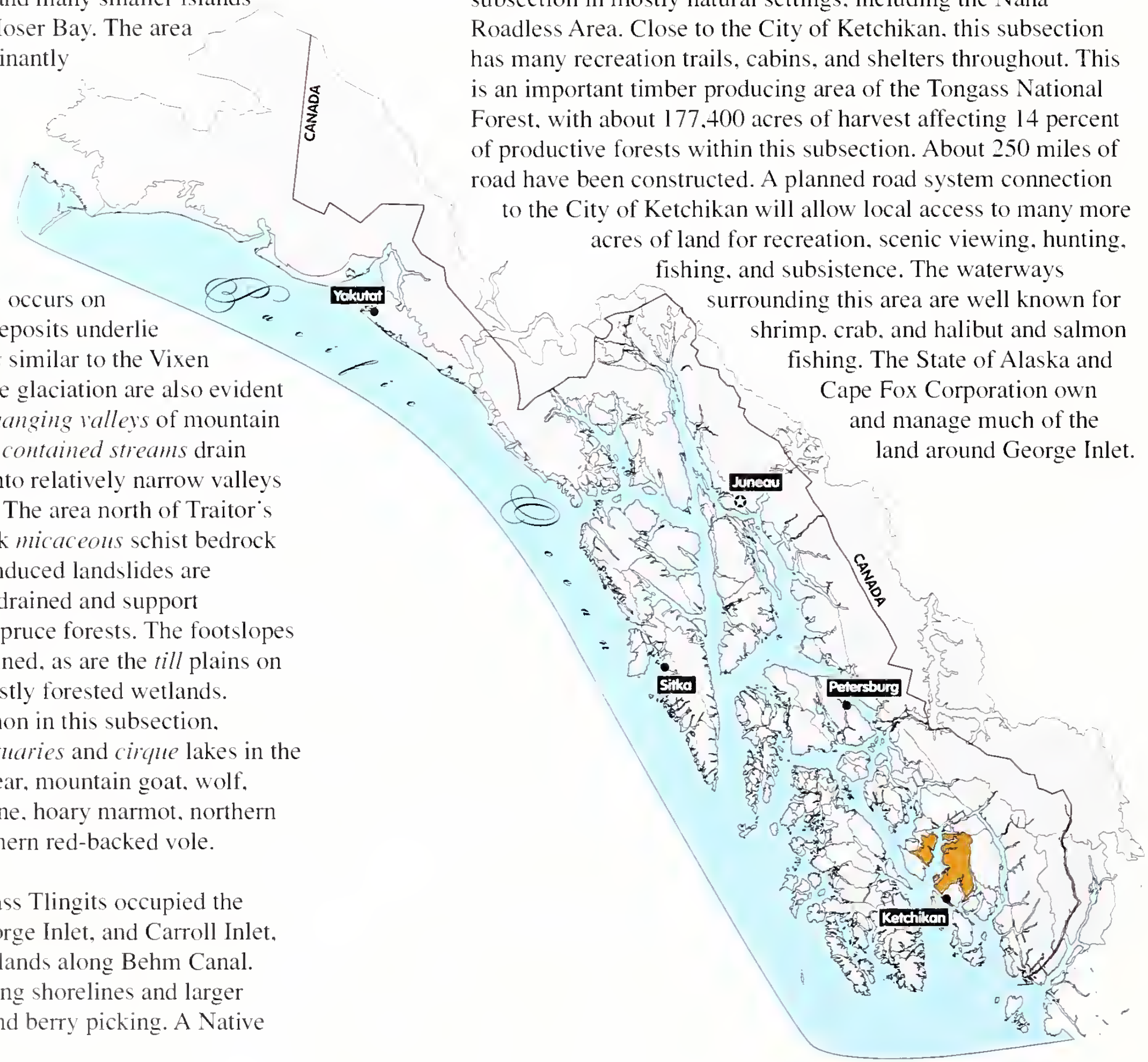


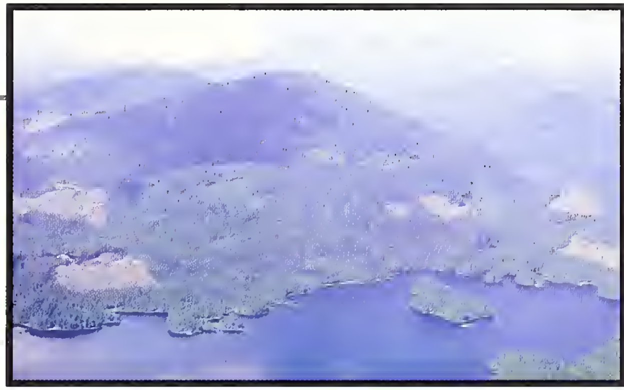


Traitor's Cove Metasediments

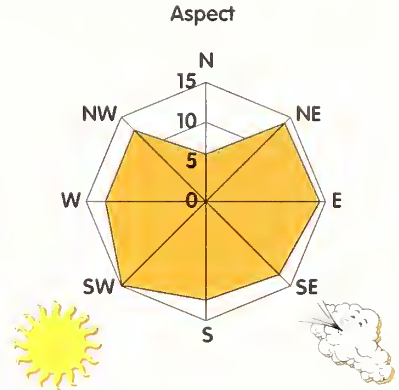
This large subsection lies along the western half of Revillagigedo Island and Cleveland Peninsula from Helm Bay to Spacious Bay. It also includes Betton and Grant Islands and many smaller islands along Clover Passage, Naha Bay, and Moser Bay. The area is generally steep, composed of predominantly sedimentary rocks with small *plutonic* intrusions of diorite, granodiorite, and tonalite. The effects of the continental ice sheets are deeply etched on this landscape through its large waterways, such as Behm Canal, Gedney Passage, Neets Bay, Traitors Cove, and other features. A large, nearly-level landscape occurs on Cleveland Peninsula where glacial *till* deposits underlie *palustrine forest and emergent wetlands* similar to the Vixen Inlet Till Lowlands. The effects of alpine glaciation are also evident where *cirque* basin lakes are tucked in *hanging valleys* of mountain summits. Deeply incised, *high gradient contained streams* drain freely from the steep mountain slopes into relatively narrow valleys of mixed *alluvium* and bedrock control. The area north of Traitor's Cove is particularly unstable due to slick *micaceous* schist bedrock and steep slopes. Natural- and human-induced landslides are common. Soils are predominantly well drained and support productive western hemlock and Sitka spruce forests. The footslopes and narrow valleys are more poorly drained, as are the *till* plains on Cleveland Peninsula, which support mostly forested wetlands. *Palustrine emergent wetlands* are common in this subsection, occurring adjacent to the many large *estuaries* and *cirque* lakes in the area. Common animals include black bear, mountain goat, wolf, Sitka black-tailed deer, marten, wolverine, hoary marmot, northern flying squirrel, Keen's mouse, and southern red-backed vole.

Land-Human Interactions. The Tongass Tlingits occupied the lands adjacent to Tongass Narrows, George Inlet, and Carroll Inlet, whereas the Saxman Tlingits inhabited lands along Behm Canal. Tlingits concentrated their activities along shorelines and larger drainages, including fishing, hunting, and berry picking. A Native village once existed at the present site of Loring at Naha Bay. Today, the U.S. Forest Service manages about half of this subsection in mostly natural settings, including the Naha Roadless Area. Close to the City of Ketchikan, this subsection has many recreation trails, cabins, and shelters throughout. This is an important timber producing area of the Tongass National Forest, with about 177,400 acres of harvest affecting 14 percent of productive forests within this subsection. About 250 miles of road have been constructed. A planned road system connection to the City of Ketchikan will allow local access to many more acres of land for recreation, scenic viewing, hunting, fishing, and subsistence. The waterways surrounding this area are well known for shrimp, crab, and halibut and salmon fishing. The State of Alaska and Cape Fox Corporation own and manage much of the land around George Inlet.

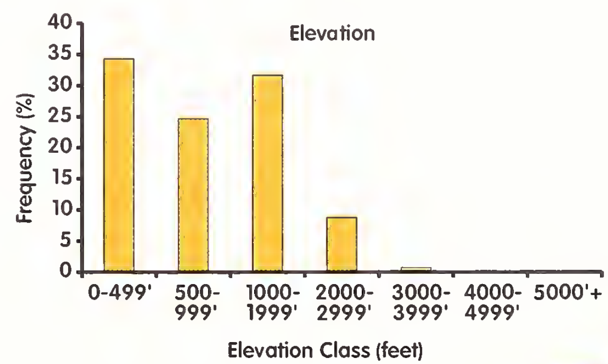




The rounding effects of continental ice are apparent when overlooking the large waterways of Upper Neets Bay (foreground) and Gedney Pass (far right center). Here, relatively steep mountain slopes often front waterways and fjords. The high productivity of this country has made it one of primary importance for commercial timber harvest.

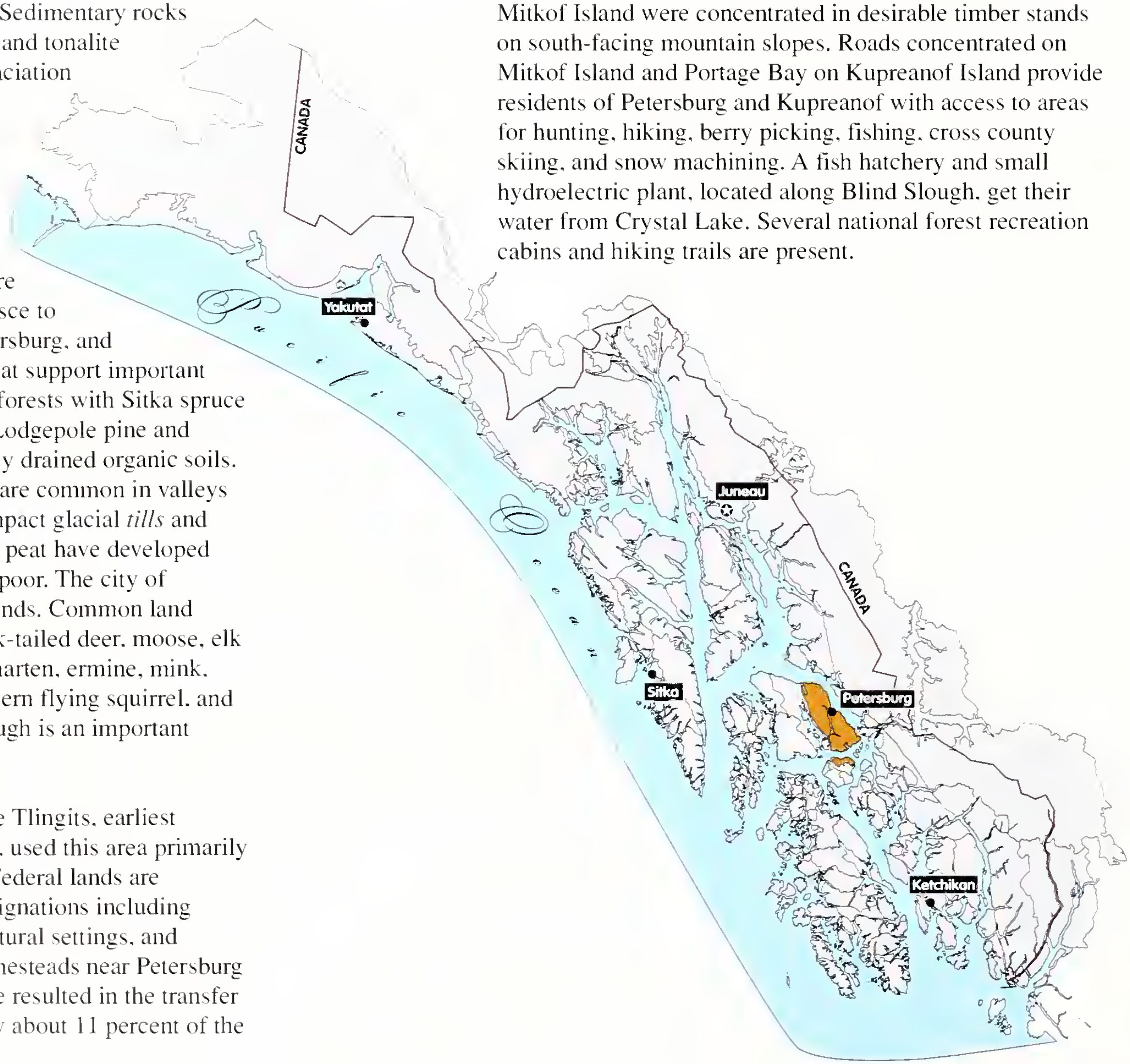


Traitors Cove Metasediments	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (66%)	Valley Floor (13%)	Mountain Summits (11%)	Hills (10%)	Coastal (1%)	83
Parent Materials	Residuum (35%)	Organic Material (28%)	Colluvium (26%)	Glacial Drift (4%)	Alluvial (3%)	68
Soils	Spodosols (50%)	Histosols (35%)	Inceptisols (10%)	Entisols (3%)	Miscellaneous (1%)	83
Landcover	Hemlock (38%)	Brush (13%)	Hemlock-Spruce (12%)	Lodgepole Pine (11%)	Mixed Conifer (9%)	100
Productivity	Productive Forests (55%)	Nonproductive Forests (31%)	Nonforested (14%)			100
Site Index	SI >80 (38%)	SI 41-60 (28%)	SI 0-40 (18%)	SI 61-80 (17%)		97
Wetlands	Upland (60%)	Palustrine Forested (25%)	Palustrine Emergent (10%)	Palustrine Scrub-Shrub (3%)	Lacustrine Limnetic (2%)	100
Stream Process Groups	High Gradient-Contained (64%)	Moderate Gradient-Contained (8%)	Floodplain (8%)	Moderate Gradient-Mixed Control (8%)	Lake (6%)	
Land Use Designations	Mostly Natural Setting (49%)	Intensive Development (23%)	Moderate Development (16%)	Private (12%)		100



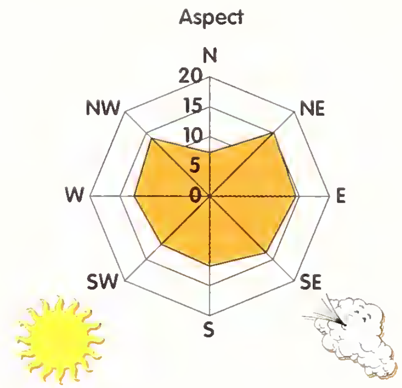
Centered on Wrangell Narrows, this subsection spans the Lindenberg Peninsula of Kupreanof Island, Mitkof Island, and the northern portion of Zarembo Island. Sedimentary rocks with scattered intrusions of granodiorite and tonalite underlie this area. Heavy *Pleistocene* glaciation reduced and rounded the mountains into octopus-like clusters separated by broad U-shaped valleys. Retreating glaciers left behind substantial *till* deposits over the landscape. The moderately high rainfall has eroded the rough slopes, creating moderately steep streams that are short and mainly contained. These coalesce to form larger drainages such as Falls, Petersburg, and Portage Creeks in broad lower valleys that support important runs of salmon and steelhead. Hemlock forests with Sitka spruce and cedar occupy the mountain slopes. Lodgepole pine and mixed-conifer forests are found on poorly drained organic soils. Both forested and nonforested wetlands are common in valleys and coastal lowlands underlain with compact glacial *tills* and *glaciomarine* sediments. Thick layers of peat have developed where subsurface drainage is especially poor. The city of Petersburg is built on one of these peatlands. Common land mammals include black bear, Sitka black-tailed deer, moose, elk (on Zarembo Island), wolf, wolverine, marten, ermine, mink, common and dusky shrew, red and northern flying squirrel, and long-tailed and meadow vole. Blind Slough is an important wintering area for trumpeter swans.

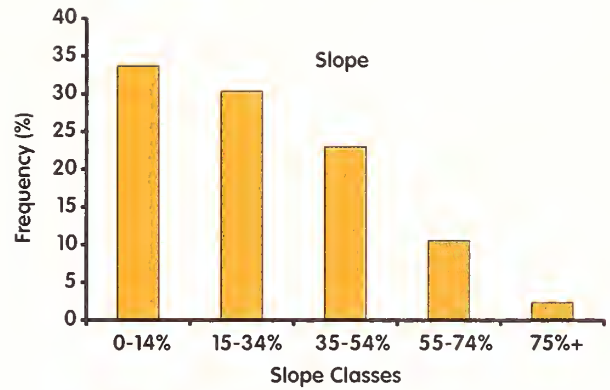
Land-Human Interactions. The Stikine Tlingits, earliest known inhabitants of Wrangell Narrows, used this area primarily for harvesting salmon, mink, and bear. Federal lands are currently managed through a mix of designations including moderate and intensive development, natural settings, and wilderness. State land selections for homesteads near Petersburg and the quaint hamlet of Kupreanof have resulted in the transfer of land into private ownership. Currently about 11 percent of the land is privately owned. Timber harvest peaked in the 1970s and 1980s but now is much reduced. Past timber harvests on Mitkof Island were concentrated in desirable timber stands on south-facing mountain slopes. Roads concentrated on Mitkof Island and Portage Bay on Kupreanof Island provide residents of Petersburg and Kupreanof with access to areas for hunting, hiking, berry picking, fishing, cross county skiing, and snow machining. A fish hatchery and small hydroelectric plant, located along Blind Slough, get their water from Crystal Lake. Several national forest recreation cabins and hiking trails are present.

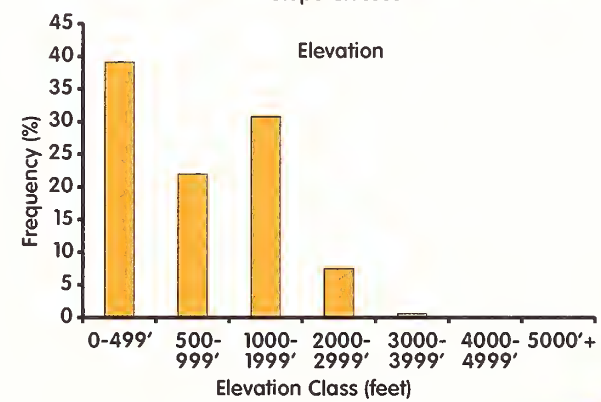


Lindenberg Peninsula of Kupreanof Island as looking north from the Wrangell Narrows near Petersburg. Petersburg Mountain and the mouth of Petersburg Creek can be seen center-right. Beyond lies Frederick Sound and the mainland. Petersburg is just off the photo on the right. Mountains are rounded and generally less than 3,000 feet in elevation.

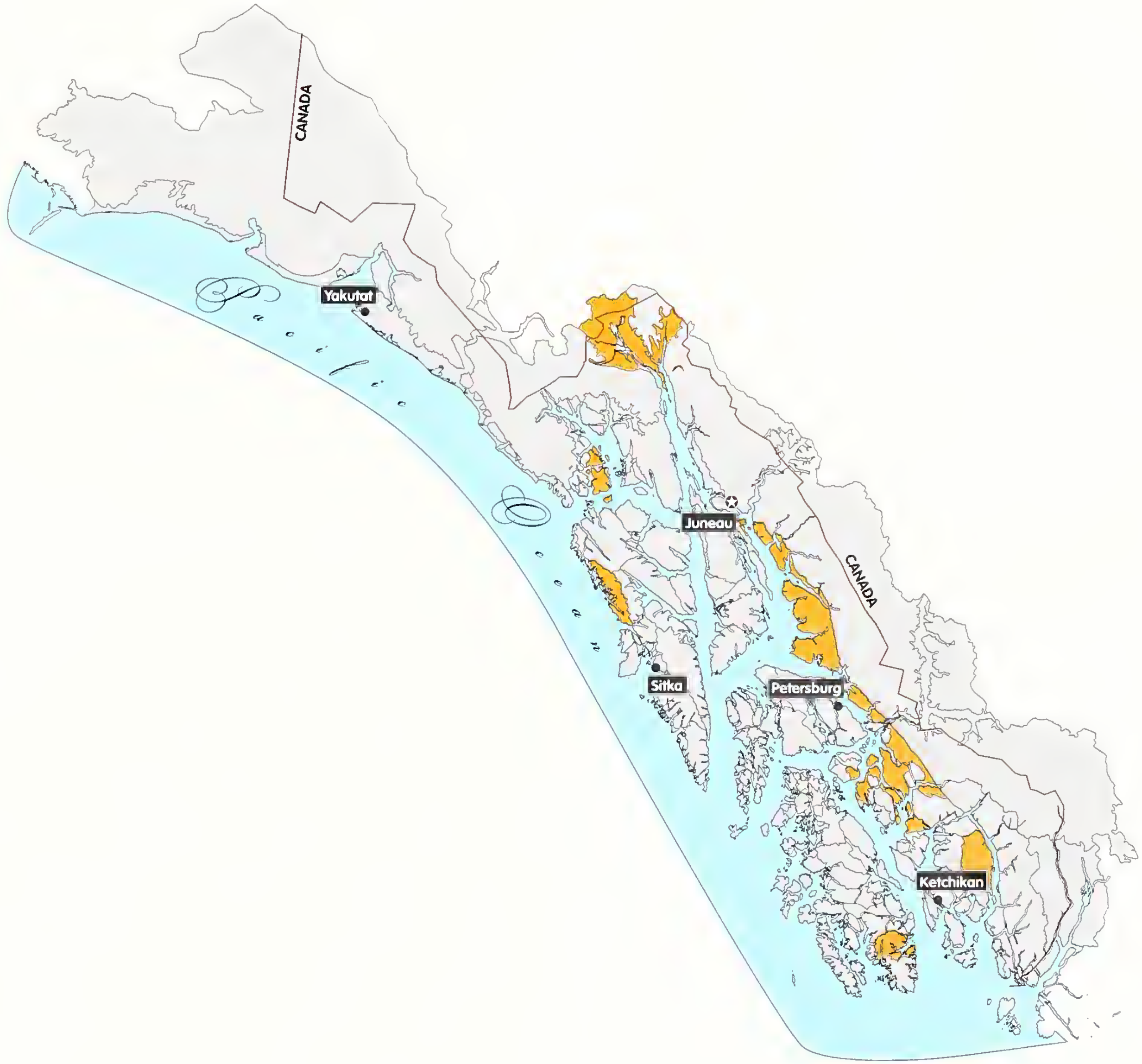
Wrangell Narrows Metasediments	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (47%)	Lowlands (33%)	Hills (8%)	Valley Floor (7%)	Mountain Summits (4%)	99
Parent Materials	Residuum (38%)	Colluvium (37%)	Ablation Till (10%)	Compact Till (7%)	Glacial Drift (4%)	75
Soils	Spodosols (54%)	Histosols (41%)	Inceptisols (4%)	Entisols (1%)		99
Landcover	Hemlock (35%)	Hemlock-Spruce (13%)	Lodgepole Pine (11%)	Mixed Conifer (10%)	Other (10%)	100
Productivity	Productive Forests (54%)	Nonproductive Forests (32%)	Nonforested (14%)			100
Site Index	SI 0-40 (36%)	SI 61-80 (25%)	SI 41-60 (21%)	SI >80 (18%)		100
Wetlands	Upland (66%)	Palustrine Forested (18%)	Palustrine Emergent (14%)			100
Stream Process Groups	High Gradient-Contained (55%)	Moderate Gradient-Mixed Control (17%)	Floodplain (9%)	Moderate Gradient-Contained (9%)	Palustrine (3%)	
Land Use Designations	Moderate Development (33%)	Intensive Development (23%)	Mostly Natural Setting (22%)	Wilderness & Monument (11%)	Private (11%)	100





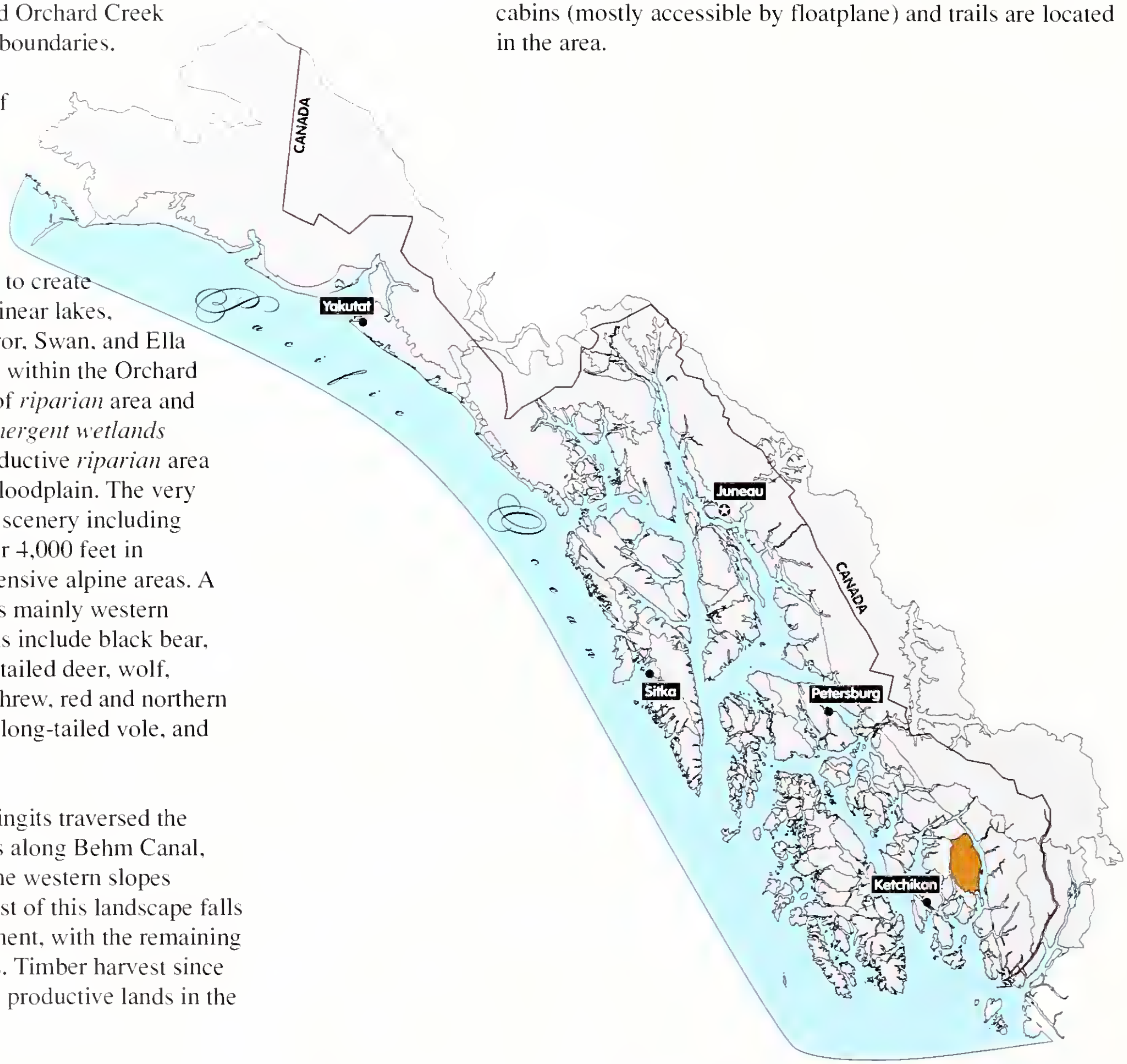


These "complex" areas have a wide variety of *lithologies* composed principally of *undivided* sedimentary and volcanic rocks. Common rock types include basalt and andesite as well as volcanic *breccia* and *tuffs*, *graywacke* (a muddy sandstone), mudstone, carbonate rocks (limestone), conglomerate and the regionally *metamorphosed* equivalents of these strata. These rocks may be relatively undeformed to highly *deformed*. Glacial scour and drainage networks tend to follow geologic structure and bedding, if present. Soils mimic the original texture of the bedrock or parent material. Landslides often initiate at soil-bedrock contacts on steep slopes. A mixture of forest types and plant communities exists across the area as a function of drainage, aspect, and elevation.

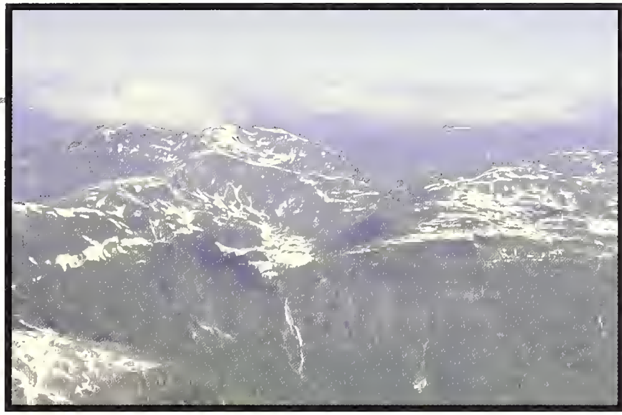

CANADA
Yakutat
Pacific Ocean
Juneau
CANADA
Sitka
Petersburg
Ketchikan

Behm Canal Complex

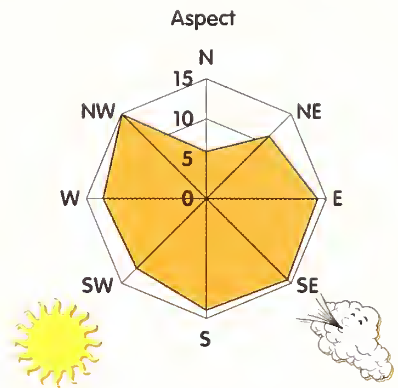
This subsection on the eastern half of Revillagigedo Island starts at Wasp Cove and extends northward along Behm Canal on its eastern side. Carroll Inlet and Carroll and Orchard Creek drainages form its western and northern boundaries. The bedrock is a mixture of sedimentary rocks with some volcanics and *plutons* of granodiorite and tonalite. A band of carbonates bounds the southern end of this subsection. The glacial ice sheet flowed over the more resistant granitic *plutons* and deeply scoured the less resistant sedimentary and volcanic rocks to create deep, narrow valleys occupied by long, linear lakes, such as Lake Grace and Manzanita, Mirror, Swan, and Ella Lakes. Unconsolidated *surficial deposits* within the Orchard Creek drainage underlie large expanses of *riparian* area and freshwater *estuaries* where *palustrine emergent wetlands* dominate. Orchard Creek is a highly productive *riparian* area containing huge Sitka spruce within its floodplain. The very rough topography makes for spectacular scenery including rounded mountain summits reaching over 4,000 feet in elevation, rock walls, cliff faces, and extensive alpine areas. A thin layer of soil on steep slopes supports mainly western hemlock forests. Common land mammals include black bear, mountain goat (introduced), Sitka black-tailed deer, wolf, marten, wolverine, common and dusky shrew, red and northern flying squirrel, southern red-backed and long-tailed vole, and Keen's mouse.

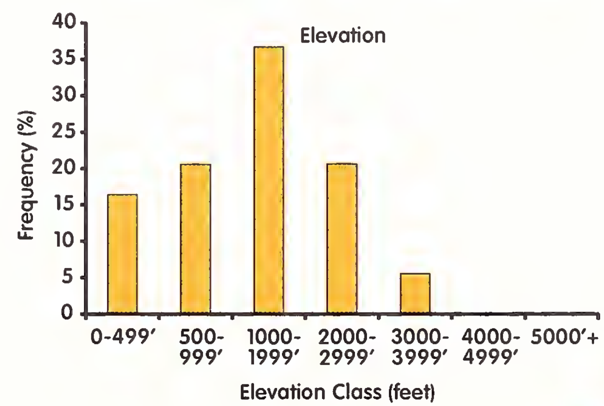


Land-Human Interactions. Saxman Tlingits traversed the eastern slopes of these rugged mountains along Behm Canal, whereas the Tongass Tlingits occupied the western slopes bordering upper Carroll Inlet. Today, most of this landscape falls within the Misty Fiords National Monument, with the remaining land managed for mostly natural settings. Timber harvest since the 1950s affected about 4 percent of the productive lands in the Marble and Licking Creek areas. Almost 37 miles of road have been constructed. Several national forest recreation cabins (mostly accessible by floatplane) and trails are located in the area.



This view of the Behm Canal Complex is over Mirror Lake on Revillagigedo Island looking northwest. This landscape is dotted with small alpine lakes (center) along with many linear-shaped lakes positioned in deep, glacially carved valleys. The complex geology of this subsection accounts for the rough topography composed of high mountain summits, rock walls, cliff faces, and extensive alpine areas.





Behm Canal Complex	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (50%)	Mountain Summits (36%)	Hills (7%)	Valley Floor (7%)		29
Parent Materials	Colluvium (43%)	Organic Material (28%)	Residuum (18%)	Bedrock (7%)	Alluvial (4%)	26
Soils	Spodosols (63%)	Histosols (17%)	Inceptisols (10%)	Miscellaneous (7%)	Entisols (3%)	29
Landcover	Hemlock (26%)	Alpine (25%)	Other (14%)	Hemlock-Spruce (14%)	Lodgepole Pine (9%)	100
Productivity	Nonproductive Forests (41%)	Productive Forests (40%)	Nonforested (19%)			100
Site Index	SI 0-40 (78%)	SI >80 (9%)	SI 61-80 (8%)	SI 41-60 (5%)		89
Wetlands	Upland (67%)	Palustrine Forested (15%)	Palustrine Emergent (10%)	Palustrine Scrub-Shrub (4%)	Lacustrine Limnetic (4%)	100
Stream Process Groups	High Gradient-Contained (60%)	Lake (10%)	Floodplain (10%)	Moderate Gradient-Mixed Control (6%)	Palustrine (5%)	
Land Use Designations	Wilderness & Monument (65%)	Mostly Natural Setting (18%)	Intensive Development (14%)	Moderate Development (2%)	Private (1%)	100

Berg Bay Complex

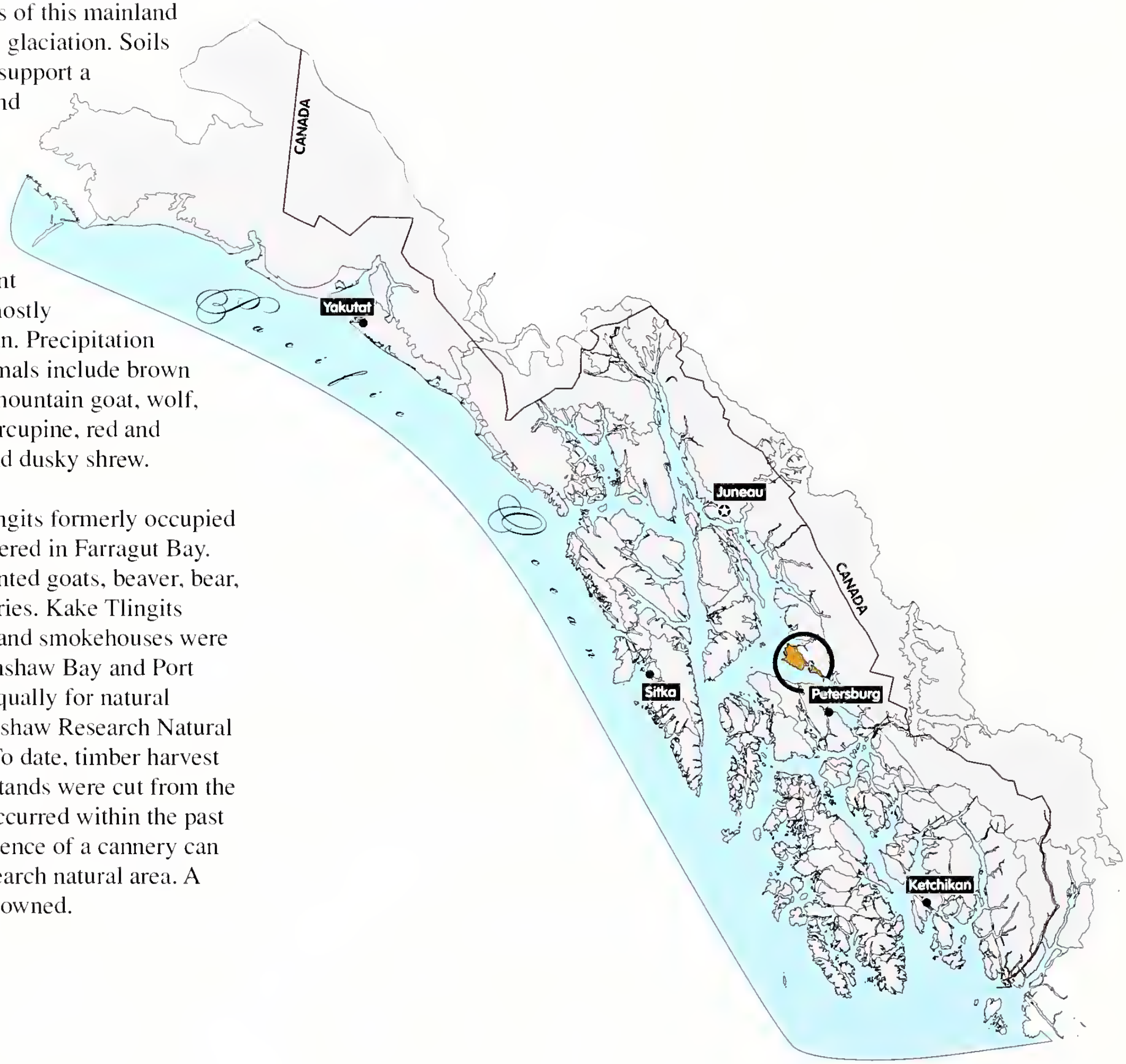
This subsection encompasses a series of fragmented mountains spanning the western side of lower Glacier Bay and Lemesurier Island in Icy Strait. This subsection contains mixed lithologies of noncalcareous sediments and granitic bedrock. Some carbonates exist within Marble and White Cap Mountains. *Neoglacial* ice was 1,900 feet thick at Marble Mountain, but attenuated quickly off to the sides as it reached its *Little Ice Age* maximum. Lobes extended only into the fringes of the Dundas Valley out of Berg Bay, Fingers Bay, and Geikie Inlet. None of the mountaintops were covered. Wetlands not covered by *neoglacial* ice are generally mature bogs and fens in the intermontane swales. Common land animals include brown and black bear, mountain goat, moose, wolf, wolverine, hoary marmot, tundra and long-tailed vole, river otter, and mink.

Land-Human Interactions. The Chookaneidí clan of the Hoonah people occupied much of this subsection within Glacier Bay. The T'akdeintaan clan of the Hoonah Tlingits once occupied forts on Drake and Lemesurier Islands. The waters surrounding Lemesurier Island were highly valued for seal hunting. Today, the entire mainland area is designated wilderness within the Glacier Bay National Park and Preserve. Lemesurier Island is part of the Pleasant-Lemesurier-Inian Island Wilderness managed by the U.S. Forest Service.

A mountain V-notch within the Berg Bay Complex frames Fingers Bay and Whidbey Passage on the west side of Glacier Bay looking northward. Mountain forests give way to avalanche openings and alpine communities at about 1000 feet above sea level. The pale-colored mountain in the back center is Marble Mountain, which partially obstructs Drake Island.

Cape Fanshaw Complex

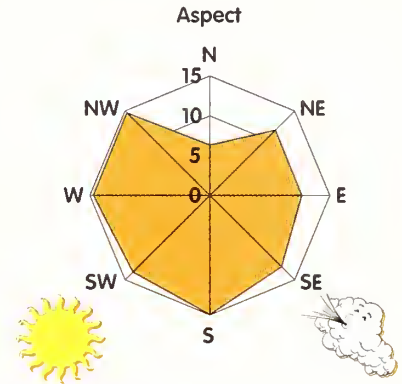
The underlying sedimentary and volcanic rocks were overridden and heavily sculptured by glacial ice during the *Pleistocene*. The rounded yet somewhat rugged mountains of this mainland peninsula are vivid testaments of intense glaciation. Soils on the slopes are mostly productive and support a mix of hemlock and spruce. Lowlands and rolling hills of this area are often underlain by glacial *till* and are poorly drained. Forested wetlands are quite abundant. The northernmost extent of sword fern and western redcedar occurs in this subsection. Only about five percent of the area is nonforested. Streams are mostly *high gradient* with short runs to the ocean. Precipitation is moderately high. Common land mammals include brown and black bear, Sitka black-tailed deer, mountain goat, wolf, wolverine, porcupine, hoary marmot, porcupine, red and northern flying squirrel, and common and dusky shrew.

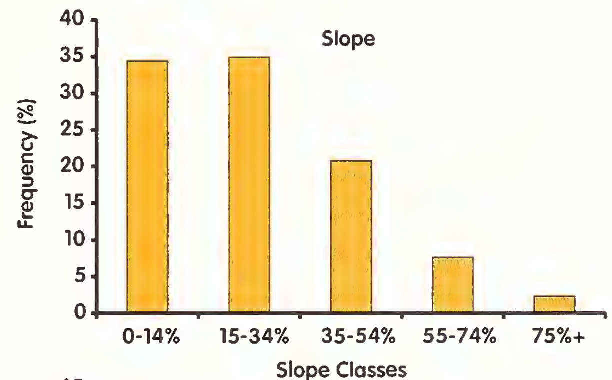


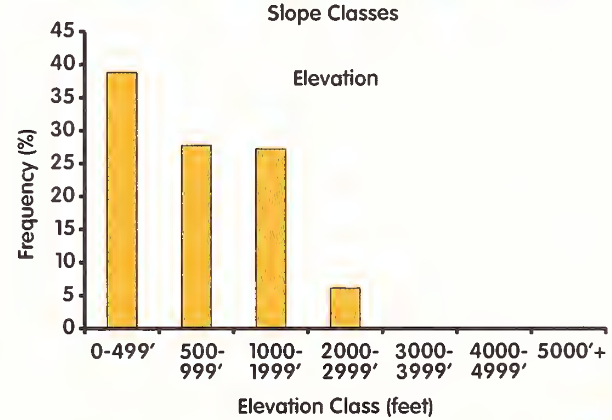
Land-Human Interactions. Stikine Tlingits formerly occupied the southern half of this subsection, centered in Farragut Bay. There, Tlingits caught and dried fish, hunted goats, beaver, bear, mink, marten, otter, seal, and picked berries. Kake Tlingits inhabited the northern half; their cabins and smokehouses were scattered on Robert Island and along Fanshaw Bay and Port Houghton. Today, the area is managed equally for natural settings and development. The Cape Fanshaw Research Natural Area is located east of Whitney Island. To date, timber harvest has been minimal although some older stands were cut from the beach in Farragut Bay. No harvest has occurred within the past 20 years. No roads are present. Past evidence of a cannery can be seen along the beaches below the research natural area. A small percentage of the land is privately owned.

An eastward view of the Cape Fanshaw mainland from near the mouth of Cat Creek. Cat Creek, on the left of the photo and an unnamed creek in the center frame Jamestown Peak. Man-of-War Peak is on the right. The jagged, snow-capped mountains of the Boundary Range Icefields on the horizon greatly contrast the rounded, gentle-sloping mountains of this subsection.

Cape Fanshaw Complex	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (55%)	Lowlands (23%)	Hills (9%)	Valley Floor (7%)	Mountain Summits (3%)	99
Parent Materials	Residuum (45%)	Colluvium (18%)	Compact Till (17%)	Ablation Till (7%)	Organic Material (6%)	83
Soils	Spodosols (54%)	Histosols (42%)	Inceptisols (3%)	Entisols (1%)		99
Landcover	Hemlock (37%)	Hemlock-Spruce (28%)	Mixed Conifer (18%)	Alpine (4%)	Lodgepole Pine (3%)	100
Productivity	Productive Forests (67%)	Nonproductive Forests (27%)	Nonforested (5%)			100
Site Index	SI 41-60 (38%)	SI 0-40 (30%)	SI 61-80 (19%)	SI >80 (13%)		100
Wetlands	Upland (50%)	Palustrine Forested (41%)	Palustrine Emergent (6%)	Palustrine Scrub-Shrub (3%)	Estuarine Intertidal (1%)	100
Stream Process Groups	High Gradient-Contained (65%)	Moderate Gradient-Mixed Control (12%)	Moderate Gradient-Contained (7%)	Low Gradient-Contained (7%)	Floodplain (6%)	
Land Use Designations	Mostly Natural Setting (48%)	Moderate Development (27%)	Intensive Development (21%)	Private (4%)		100

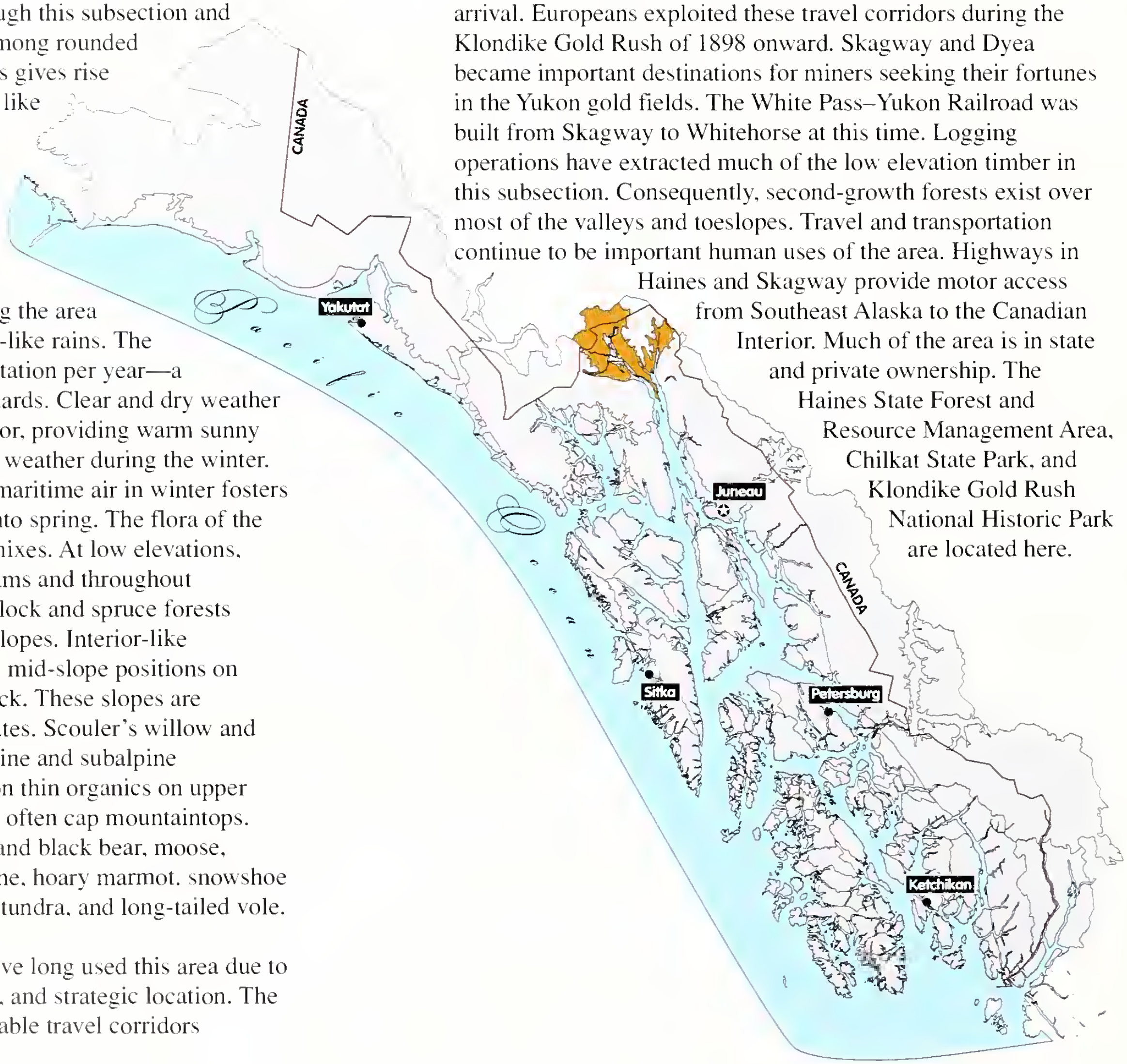




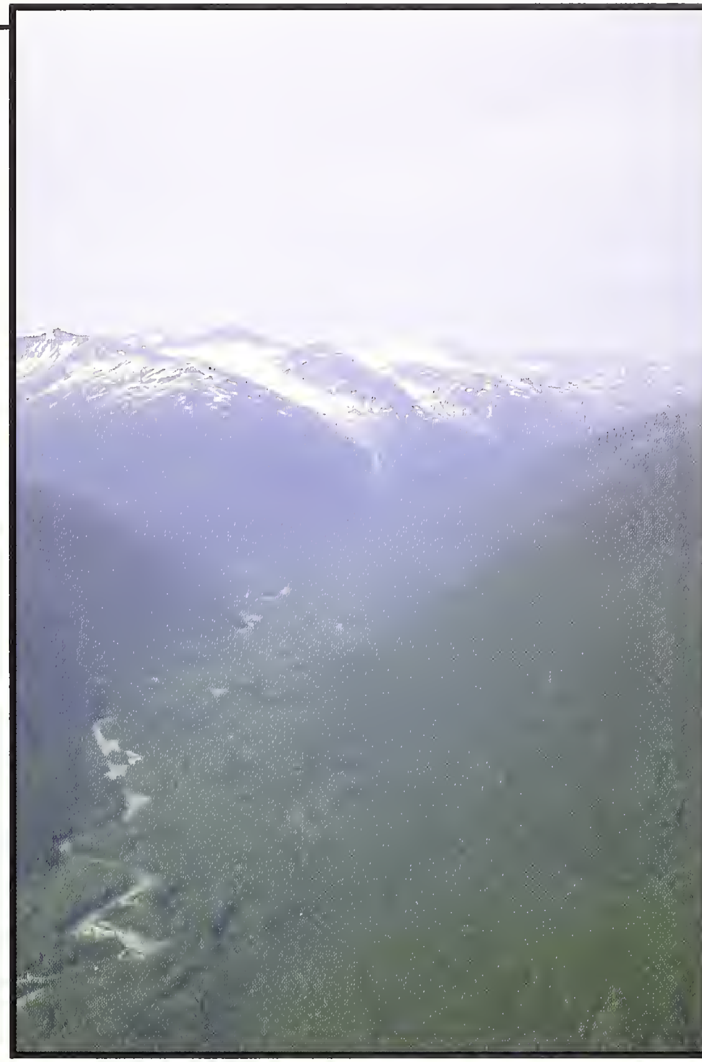


Chilkat Complex

This glacially scoured *terrain* is sandwiched between two towering mountain ranges along the U.S.–Canada border. A number of faults, including the great Denali fault, cut through this subsection and underlie deep, glacially carved valleys among rounded mountains. The orientation of these faults gives rise to parallel ridges and valleys that radiate like wheel spokes from the head of Lynn Canal. The unique geographic location of this subsection produces an unusual mix of maritime and Interior characteristics. The St. Elias, Fairweather, and Chilkat Ranges to the west greatly affect the weather, protecting the area from severe coastal storms and monsoon-like rains. The area receives about 100 inches of precipitation per year—a moderate sum by Southeast Alaska standards. Clear and dry weather systems regularly push in from the Interior, providing warm sunny weather during the summer and cold dry weather during the winter. The clash of cold continental and moist maritime air in winter fosters abundant snow cover that persists well into spring. The flora of the area also reflects maritime and Interior mixes. At low elevations, cottonwood occurs along rivers and streams and throughout floodplains. Outside *riparian* areas, hemlock and spruce forests dominate valley floors and *colluvial* toeslopes. Interior-like lodgepole pine and birch forests occur to mid-slope positions on shallow organic soils over *talus* or bedrock. These slopes are dissected by landslide and avalanche chutes. Scouler's willow and Sitka alder are abundant throughout. Alpine and subalpine communities of shrubs and forbs occur on thin organics on upper slopes and mountaintops. Alpine barrens often cap mountaintops. Common land mammals include brown and black bear, moose, mountain goat, wolf, wolverine, porcupine, hoary marmot, snowshoe hare, and northern red-backed, meadow, tundra, and long-tailed vole.



Land-Human Interactions. Humans have long used this area due to its desirable climate, abundant resources, and strategic location. The low mountain passes have provided valuable travel corridors between maritime and Interior cultures for centuries. The Chilkat and Chilkoot Tlingits resided in this area prior to European arrival. Europeans exploited these travel corridors during the Klondike Gold Rush of 1898 onward. Skagway and Dyea became important destinations for miners seeking their fortunes in the Yukon gold fields. The White Pass–Yukon Railroad was built from Skagway to Whitehorse at this time. Logging operations have extracted much of the low elevation timber in this subsection. Consequently, second-growth forests exist over most of the valleys and toeslopes. Travel and transportation continue to be important human uses of the area. Highways in Haines and Skagway provide motor access from Southeast Alaska to the Canadian Interior. Much of the area is in state and private ownership. The Haines State Forest and Resource Management Area, Chilkat State Park, and Klondike Gold Rush National Historic Park are located here.

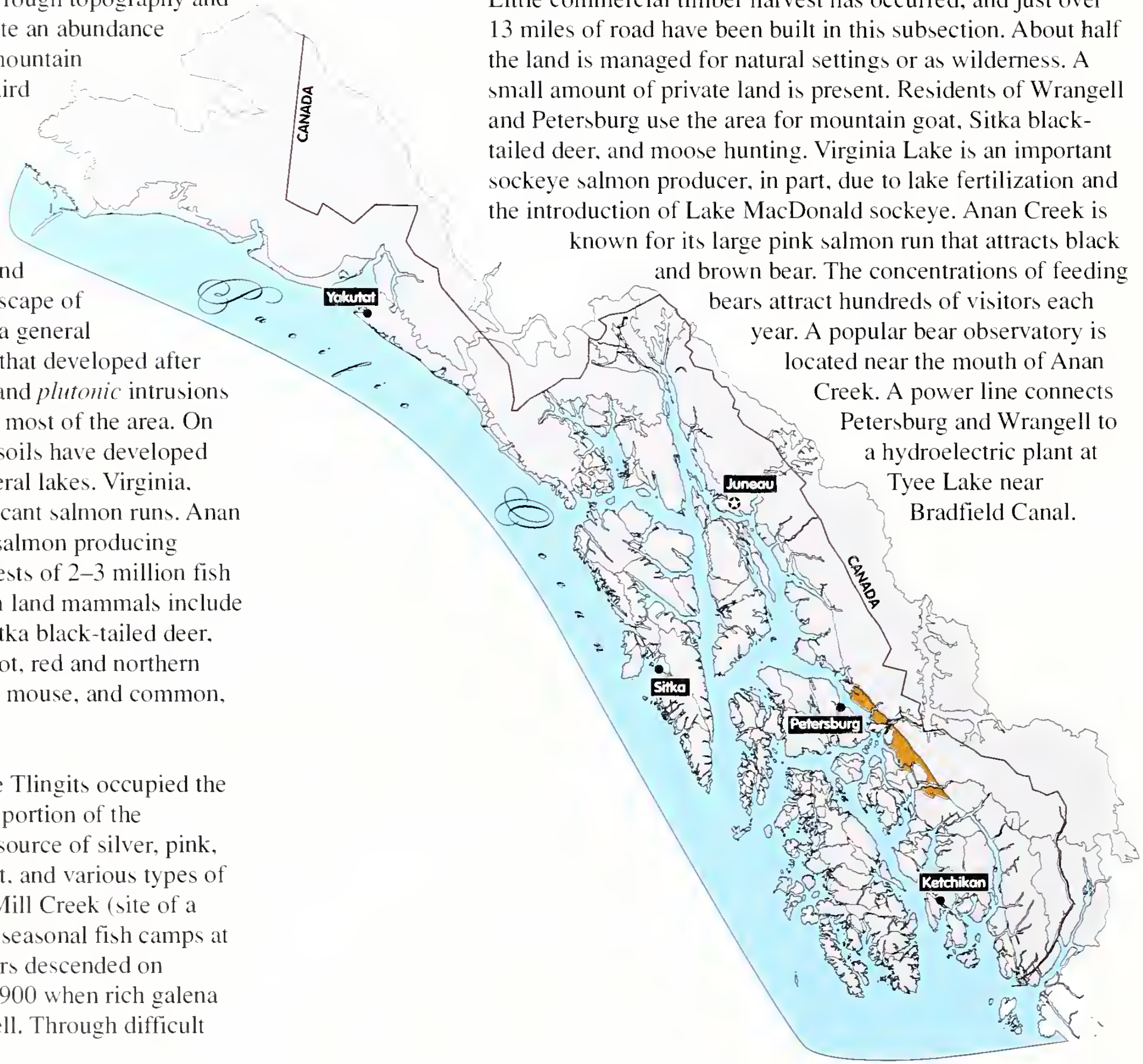


The effects of glaciation are indelibly etched in this landscape, as represented by the Taiya River Valley northeast of Dyea. Following faults and bedrock weaknesses, continental ice sheets from the coastal mountains converged on and intensely scoured the Chilkat Complex. Today, forests cover valley bottoms and lower mountain slopes, whereas alpine barrens and meadows cap mountains. Avalanches commonly sweep upper mountain slopes.

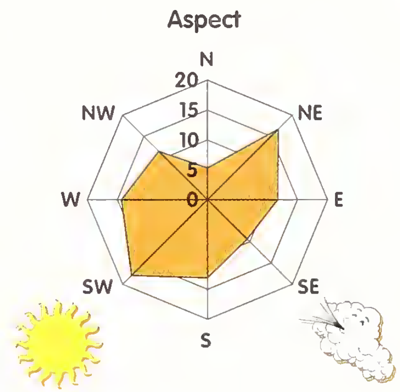
Eastern Passage Complex

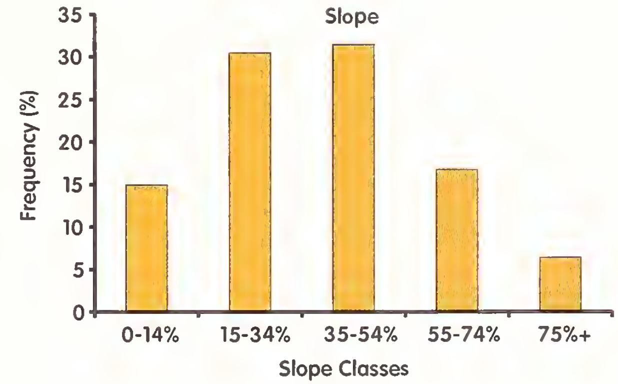
This mainland subsection includes the sedimentary and volcanic surfaces west of the Coast Range *megalineament* from south of the Bradfield Canal to Thomas Bay. The rough topography and moderately high rainfall combine to create an abundance of streams that cascade down the steep mountain slopes. While alpine occupies nearly a third of the land, the lower slopes support hemlock and hemlock-spruce forests, about 60 percent of which is productive forest. Of wetlands occupying about one fifth of the area, roughly half are forested. The glaciers that covered the land during the *Pleistocene* left behind a landscape of rounded ridge tops, steep sidewalls, and a general absence of glacial *till*. The mineral soils that developed after glaciation reflect the sedimentary strata and *plutonic* intrusions of granodiorite and tonalite that underlie most of the area. On more poorly drained substrates, organic soils have developed and are common. Glacial retreat left several lakes. Virginia, Anan, and Boulder Lakes support significant salmon runs. Anan Creek is one of the world's largest pink salmon producing streams and is estimated to support harvests of 2–3 million fish annually (Halupka et al. 2000). Common land mammals include brown and black bear, mountain goat, Sitka black-tailed deer, wolf, wolverine, porcupine, hoary marmot, red and northern flying squirrel, red-backed voles, Keen's mouse, and common, dusky and water shrew.

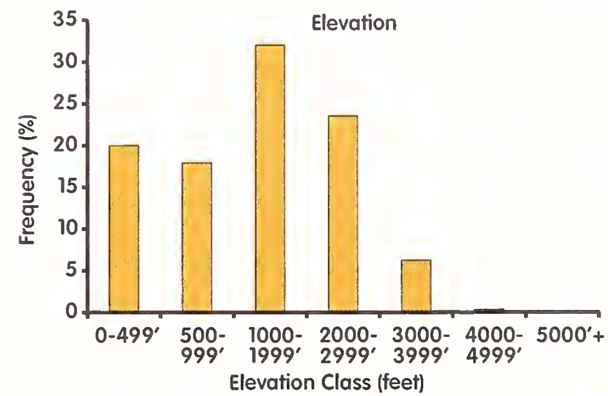
Land-Human Interactions. The Stikine Tlingits occupied the coastline and larger drainages along this portion of the mainland. This mountainous area was a source of silver, pink, and sockeye salmon, bear, mountain goat, and various types of berries. Native villages were located at Mill Creek (site of a great sockeye run) and Anan Creek, and seasonal fish camps at Aaron Creek and Eagle River. Prospectors descended on Groundhog and Glacier Basins around 1900 when rich galena deposits were discovered east of Wrangell. Through difficult *terrain* and weather conditions, miners painstakingly extracted lead, silver, and gold from these basins until World War II. Little commercial timber harvest has occurred, and just over 13 miles of road have been built in this subsection. About half the land is managed for natural settings or as wilderness. A small amount of private land is present. Residents of Wrangell and Petersburg use the area for mountain goat, Sitka black-tailed deer, and moose hunting. Virginia Lake is an important sockeye salmon producer, in part, due to lake fertilization and the introduction of Lake MacDonald sockeye. Anan Creek is known for its large pink salmon run that attracts black and brown bear. The concentrations of feeding bears attract hundreds of visitors each year. A popular bear observatory is located near the mouth of Anan Creek. A power line connects Petersburg and Wrangell to a hydroelectric plant at Tyee Lake near Bradfield Canal.



The view from Frederick Sound looking north at the Horn Cliffs and Horn Mountain on the mainland. The town of Petersburg lies only a few miles to the west. The mountains are rugged with large expanses of alpine near the summits and carpeted with mostly hemlock and spruce at lower elevations.



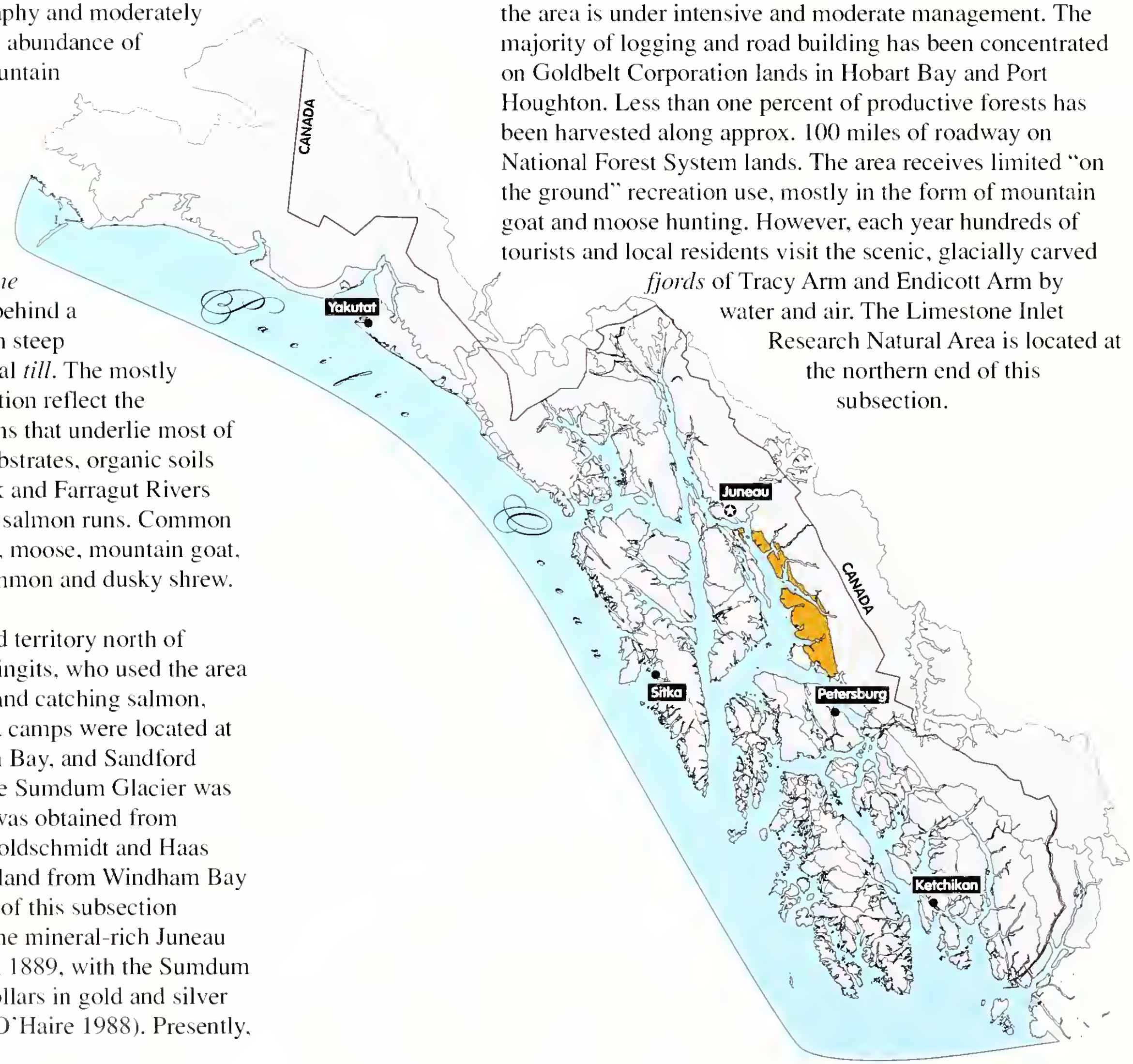


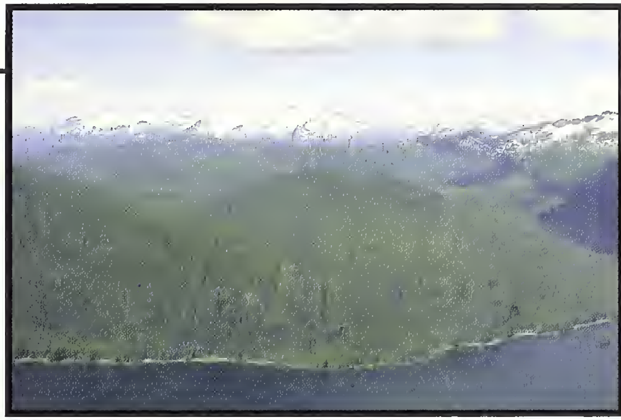


Eastern Passage Complex	Ranked Order					% GRID reporting data
	1st	2nd	3rd	4th	5th	
Landforms	Mountain Slopes (58%)	Mountain Summits (22%)	Lowlands (9%)	Hills (5%)	Valley Floor (4%)	97
Parent Materials	Residuum (70%)	Colluvium (14%)	Ablation Till (6%)	Bedrock (3%)	Alluvial (2%)	85
Soils	Spodosols (50%)	Histosols (37%)	Inceptisols (7%)	Miscellaneous (4%)	Entisols (1%)	97
Landcover	Hemlock (34%)	Alpine (27%)	Hemlock-Spruce (13%)	Other (6%)	Lodgepole Pine (6%)	100
Productivity	Productive Forests (47%)	Nonproductive Forests (29%)	Nonforested (23%)			100
Site Index	SI 0-40 (38%)	SI 41-60 (35%)	SI 61-80 (17%)	SI >80 (10%)		100
Wetlands	Upland (81%)	Palustrine Forested (9%)	Palustrine Emergent (8%)	Palustrine Scrub-Shrub (1%)		100
Stream Process Groups	High Gradient-Contained (67%)	Moderate Gradient-Mixed Control (8%)	Floodplain (7%)	Moderate Gradient-Contained (6%)	Glacial Outwash (3%)	
Land Use Designations	Mostly Natural Setting (33%)	Moderate Development (29%)	Wilderness & Monument (23%)	Intensive Development (13%)	Private (2%)	100

The eastern boundary of this mainland subsection closely parallels the Coast Range *megalineament* from Thomas Bay to Taku Inlet. Here, the very rough topography and moderately high rainfall have combined to create an abundance of streams that cascade down the steep mountain slopes. While alpine occupies nearly a quarter of the land, the lower slopes support hemlock and hemlock-spruce forests, more than half of which is productive forest. Of wetlands occupying about one fifth of the area, roughly half are forested. The *Pleistocene* glaciers that once covered the land left behind a landscape of rounded mountaintops with steep sidewalls and a general absence of glacial *till*. The mostly mineral soils that developed after glaciation reflect the sedimentary strata and *plutonic* intrusions that underlie most of the area. On the more poorly drained substrates, organic soils have developed and are common. Chuck and Farragut Rivers and Sandborn Creek support significant salmon runs. Common mammals include brown and black bear, moose, mountain goat, wolf, wolverine, hoary marmot, and common and dusky shrew.

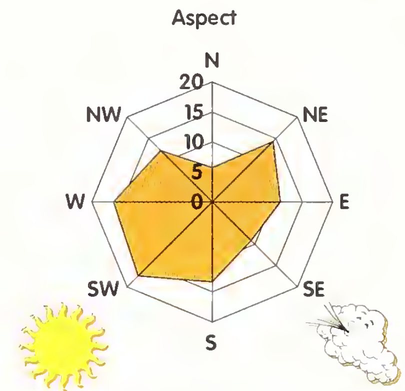
Land-Human Interactions. The rugged territory north of Windham Bay was home to the Taku Tlingits, who used the area for seal and goat hunting, fur trapping, and catching salmon, halibut, and eulachon. Taku villages and camps were located at Taku Harbor, Port Snettisham, Holkham Bay, and Sandford Cove. Sumdum Village at the base of the Sumdum Glacier was an important Native center. Limestone was obtained from Limestone Inlet for sharpening tools (Goldschmidt and Haas 1998). Kake Tlingits occupied the mainland from Windham Bay to Port Houghton. The northern portion of this subsection (Windham Bay northward) lies within the mineral-rich Juneau Gold Belt. Here, gold was discovered in 1889, with the Sumdum Mine producing nearly a half million dollars in gold and silver before its closure in 1903 (Conner and O'Haire 1988). Presently, the U.S. Forest Service manages over two-thirds of the area for wilderness and mostly natural settings. About a quarter of the area is under intensive and moderate management. The majority of logging and road building has been concentrated on Goldbelt Corporation lands in Hobart Bay and Port Houghton. Less than one percent of productive forests has been harvested along approx. 100 miles of roadway on National Forest System lands. The area receives limited "on the ground" recreation use, mostly in the form of mountain goat and moose hunting. However, each year hundreds of tourists and local residents visit the scenic, glacially carved *fjords* of Tracy Arm and Endicott Arm by water and air. The Limestone Inlet Research Natural Area is located at the northern end of this subsection.

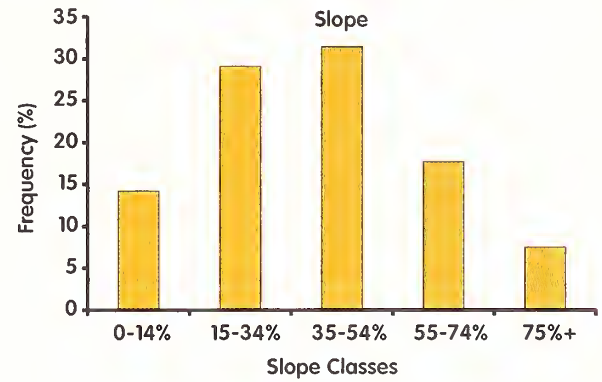


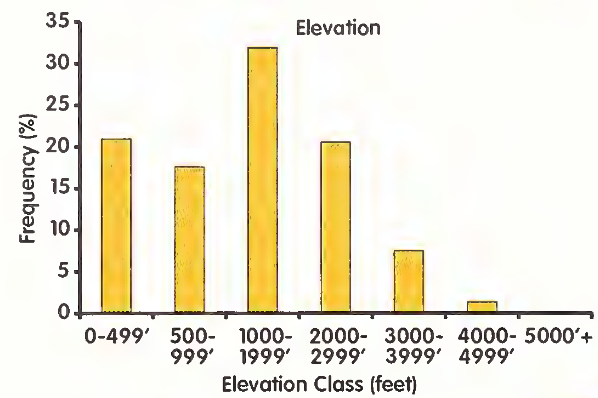


A view to the east from Stephens Passage of the mainland just north of Point Windham. Steep, rounded mountains with large areas of alpine meadows and forested side slopes characterize this subsection.

Holkham Bay Complex	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (68%)	Mountain Summits (15%)	Valley Floor (10%)	Lowlands (4%)	Hills (2%)	77
Parent Materials	Residuum (45%)	Colluvium (23%)	Organic Material (14%)	Bedrock (9%)	Alluvial (5%)	74
Soils	Spodosols (59%)	Histosols (17%)	Inceptisols (11%)	Miscellaneous (9%)	Entisols (4%)	76
Landcover	Hemlock-Spruce (35%)	Alpine (24%)	Hemlock (21%)	Mixed Conifer (5%)	Other (4%)	100
Productivity	Productive Forests (57%)	Nonforested (22%)	Nonproductive Forests (21%)			100
Site Index	SI 0-40 (49%)	SI 41-60 (20%)	SI >80 (18%)	SI 61-80 (12%)		98
Wetlands	Upland (80%)	Palustrine Forested (12%)	Palustrine Emergent (4%)	Palustrine Scrub-Shrub (2%)	Lacustrine Limnetic (1%)	100
Stream Process Groups	High Gradient-Contained (69%)	Moderate Gradient-Mixed Control (7%)	Floodplain (6%)	Moderate Gradient-Contained (5%)	Alluvial Fan (4%)	
Land Use Designations	Mostly Natural Setting (39%)	Wilderness & Monument (32%)	Intensive Development (16%)	Moderate Development (7%)	Private (6%)	100

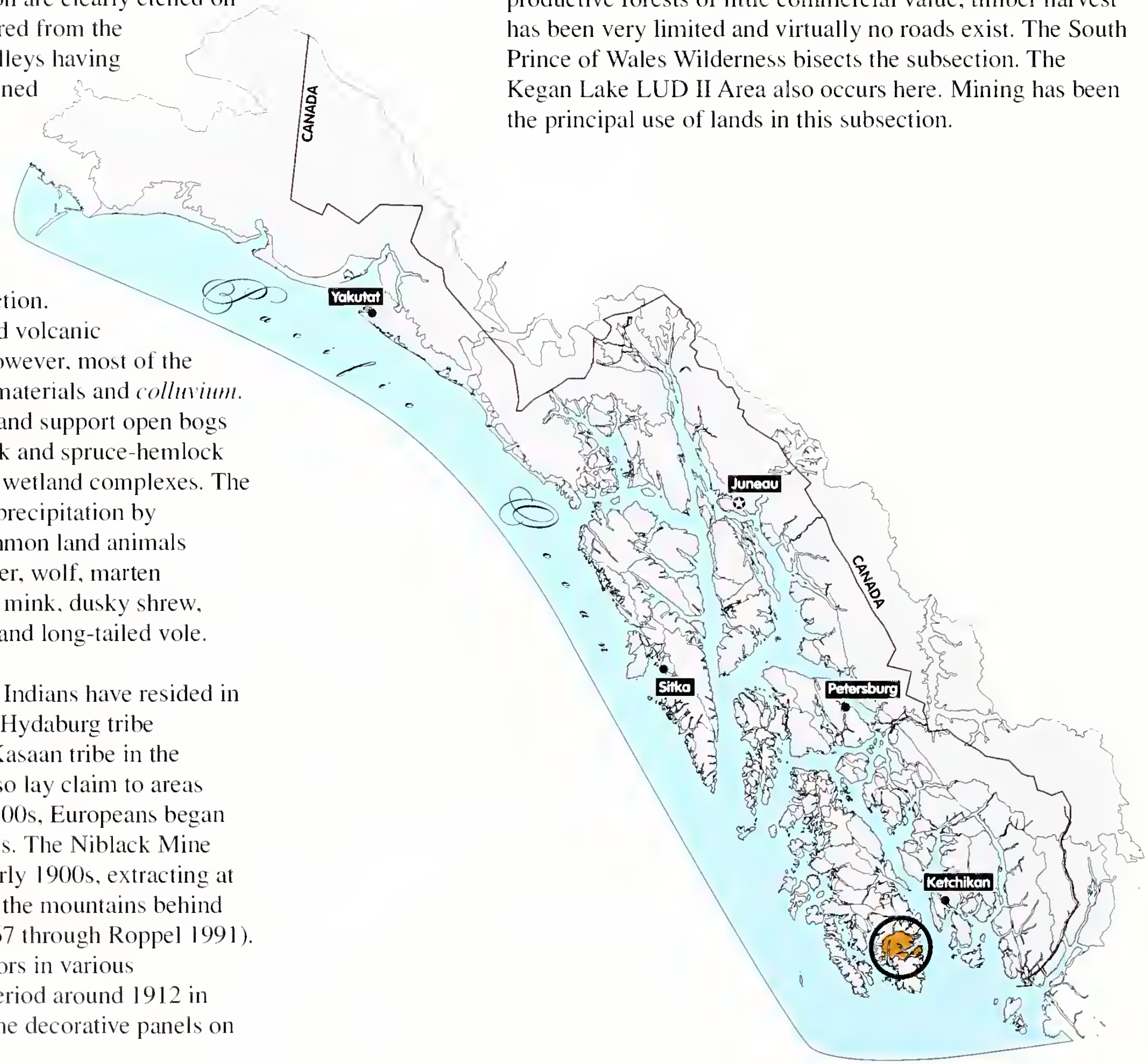






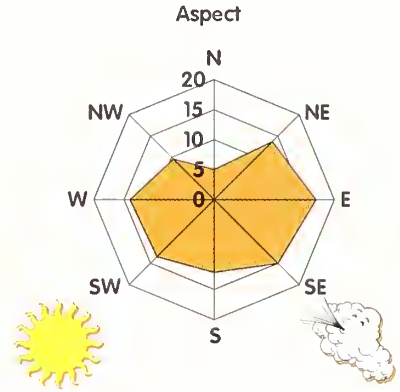
Moira Sound Complex

This rugged landscape of mountains and *fjords* extends across south Prince of Wales Island from Keete Inlet eastward to Moira Sound. Here, the effects of past glaciation are clearly etched on the land. Large alpine glaciers once poured from the rounded mountains and carved broad valleys having limited *till* deposits. Swift, highly contained streams presently descend through the upper portions of these valleys. At mid-valley these streams often flow through large elongated lakes before emptying into *fjords* at their termini. Large "finger" lakes that fill glacially scoured depressions are diagnostic of this subsection. Lightly metamorphosed sedimentary and volcanic bedrocks are exposed in some places; however, most of the sloping *terrain* is covered with organic materials and *colluvium*. Soils are predominantly poorly drained and support open bogs and fens and forested wetlands. Hemlock and spruce-hemlock forests are interspersed among the large wetland complexes. The land receives moderately high levels of precipitation by intercepting storms from the south. Common land animals include black bear, Sitka black-tailed deer, wolf, marten (introduced), ermine, river otter, beaver, mink, dusky shrew, northern flying squirrel, Keen's mouse, and long-tailed vole.

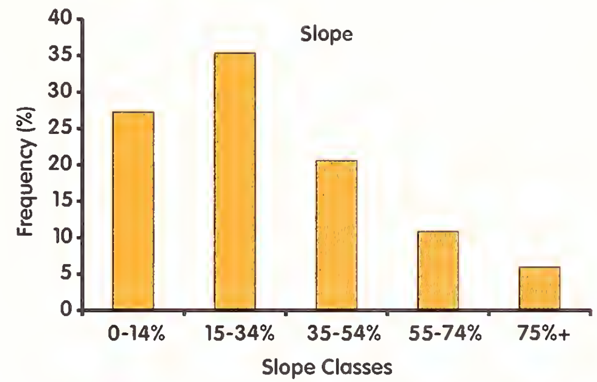


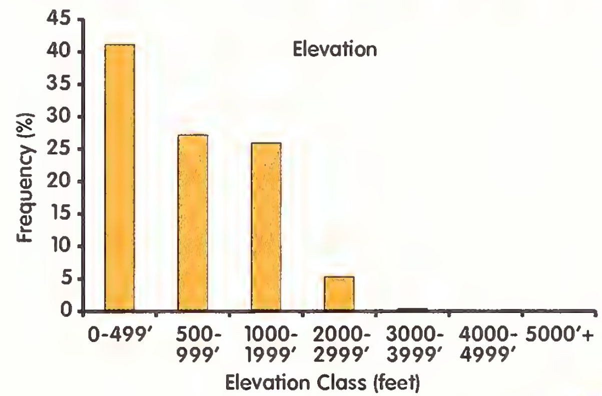
Land-Human Interactions. The Haida Indians have resided in this area since the early 1700s, with the Hydaburg tribe occupying the western portion and the Kasaan tribe in the eastern portion. The Tongass Tlingits also lay claim to areas surrounding Moira Sound. In the late 1800s, Europeans began scouring this area for valuable ore bodies. The Niblack Mine operated for a brief period during the early 1900s, extracting at least 1.4 million pounds of copper from the mountains behind Niblack Anchorage (Berg and Cobb 1967 through Roppel 1991). Marble containing a large variety of colors in various combinations was quarried for a brief period around 1912 in Dickman Bay. Much of this stone became decorative panels on buildings in Portland, Oregon. Because this rather remote portion of Prince of Wales Island supports principally low-productive forests of little commercial value, timber harvest has been very limited and virtually no roads exist. The South Prince of Wales Wilderness bisects the subsection. The Kegan Lake LUD II Area also occurs here. Mining has been the principal use of lands in this subsection.

An aerial view of Aiken Lake on the south end of Prince of Wales Island illustrates the rounded, yet rugged landscape of this subsection. The scouring action of large alpine glaciers formed depression features such as Aiken Lake. Glacial deposits occur in these valleys where "finger lakes" reside. The surrounding mountains are composed of metasedimentary and volcanic bedrock scraped bare by alpine glaciation.

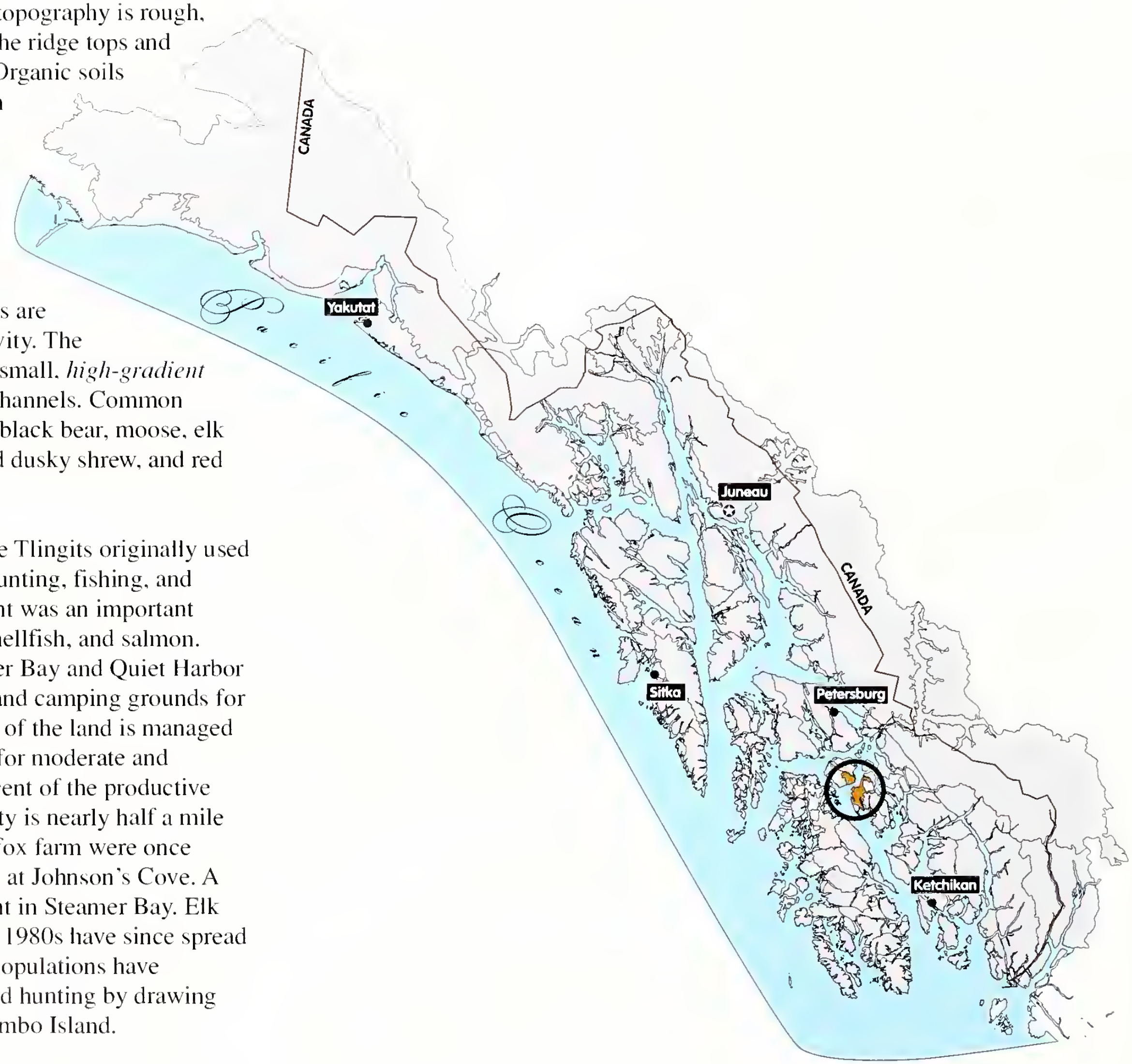


Moira Sound Complex	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (64%)	Mountain Summits (14%)	Valley Floor (12%)	Hills (9%)	Coastal (1%)	69
Parent Materials	Organic Material (38%)	Colluvium (32%)	Residuum (13%)	Bedrock (8%)	Compact Till (5%)	62
Soils	Histosols (42%)	Spodosols (40%)	Inceptisols (9%)	Miscellaneous (7%)	Entisols (1%)	69
Landcover	Hemlock (29%)	Mixed Conifer (17%)	Hemlock-Spruce (16%)	Lodgepole Pine (11%)	Rock (7%)	100
Productivity	Productive Forests (49%)	Nonproductive Forests (39%)	Nonforested (13%)			100
Site Index	SI 0-40 (42%)	SI 41-60 (28%)	SI 61-80 (16%)	SI >80 (14%)		97
Wetlands	Upland (63%)	Palustrine Forested (18%)	Palustrine Scrub-Shrub (13%)	Lacustrine Limnetic (4%)	Palustrine Unconsolidated Bottom (1%)	100
Stream Process Groups	High Gradient-Contained (61%)	Lake (14%)	Moderate Gradient-Contained (11%)	Moderate Gradient-Mixed Control (4%)	Floodplain (3%)	
Land Use Designations	Mostly Natural Setting (39%)	Intensive Development (35%)	Wilderness & Monument (23%)	Private (2%)		100





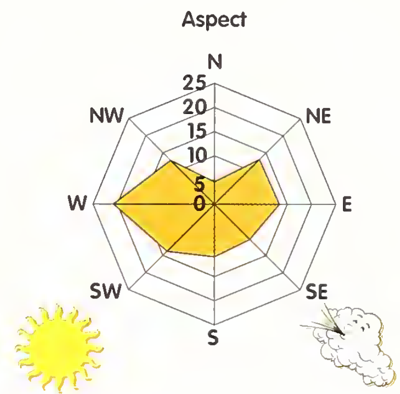
A mix of sedimentary and volcanic rocks and *surficial deposits* occur on northwest Etolin and southeast Zarembo Islands, effectively spanning Stikine Strait. The topography is rough, but *Pleistocene* glaciation has rounded the ridge tops and deposited *till* and drift in the lowlands. Organic soils have developed on these deposits and on other areas with poor drainage. Organic soils cover about half of the landscape and support extensive areas of wetlands and nonproductive forests. Hemlock and hemlock-spruce forests occupy most of the productive soils, whereas mixed-conifer and lodgepole pine forests are common on soils with low site productivity. The moderately high rainfall supports many small, *high-gradient streams* that are contained within their channels. Common animals include Sitka black-tailed deer, black bear, moose, elk (introduced), wolf, marten, common and dusky shrew, and red and northern flying squirrel.

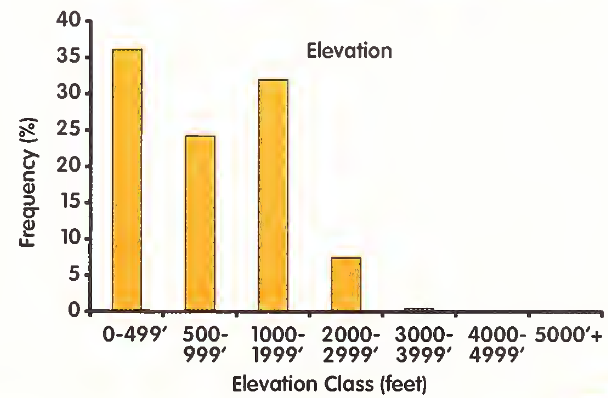


Land-Human Interactions. The Stikine Tlingits originally used the area surrounding Stikine Strait for hunting, fishing, and trapping. On Etolin Island, Steamer Point was an important subsistence area for halibut, seaweed, shellfish, and salmon. Smokehouses were located here. Steamer Bay and Quiet Harbor provided convenient nearby anchorage and camping grounds for Natives. Today, somewhat less than half of the land is managed in natural settings. The rest is managed for moderate and intensive development. About eight percent of the productive forests have been cut and the road density is nearly half a mile of road per square mile. A cannery and fox farm were once active in Steamer Bay as was a fox farm at Johnson's Cove. A national forest recreation cabin is present in Steamer Bay. Elk introduced onto Etolin Island in the late 1980s have since spread onto neighboring Zarembo Island. Elk populations have increased sufficiently to allow for limited hunting by drawing permit. Deer hunting is popular on Zarembo Island.

A view from Clarence Strait near the Screen Islands looking north over the west side of Etolin Island. Johnson Cove can be seen in the lower center of the photo. Steamer Knoll is the mountain in the center. Zarembo Island and Stikine Strait are visible near the top of the photo.

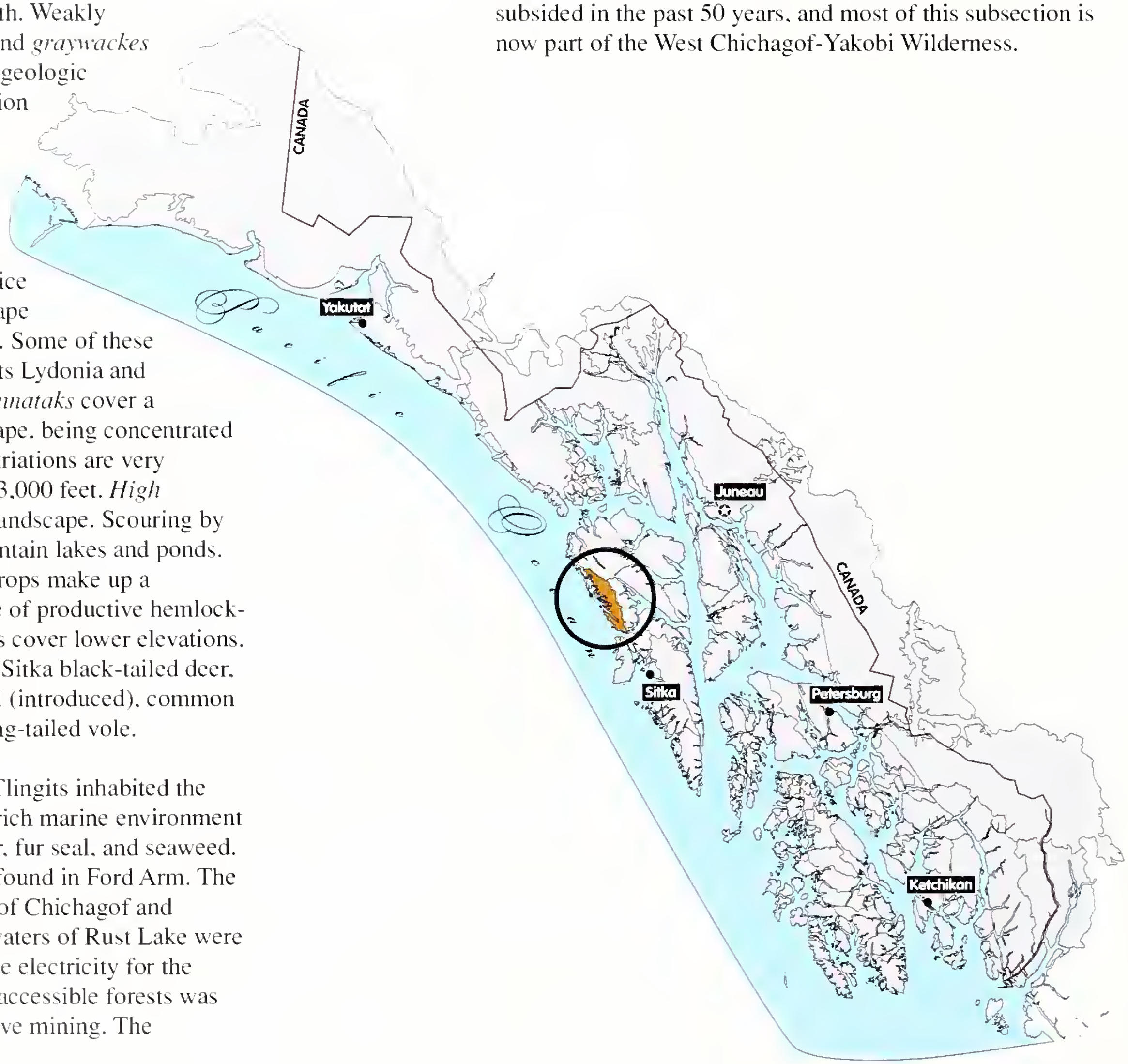
Stikine Strait Complex	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (45%)	Lowlands (39%)	Hills (8%)	Mountain Summits (6%)	Valley Floor (2%)	99
Parent Materials	Residuum (38%)	Ablation Till (23%)	Colluvium (18%)	Compact Till (11%)	Glacial Drift (7%)	68
Soils	Histosols (49%)	Spodosols (47%)	Inceptisols (1%)	Miscellaneous (1%)		99
Landcover	Hemlock (32%)	Lodgepole Pine (16%)	Hemlock-Spruce (16%)	Mixed Conifer (15%)	Other (12%)	100
Productivity	Productive Forests (52%)	Nonproductive Forests (44%)	Nonforested (5%)			100
Site Index	SI 0-40 (36%)	SI 41-60 (33%)	SI 61-80 (25%)	SI >80 (6%)		100
Wetlands	Upland (58%)	Palustrine Forested (28%)	Palustrine Emergent (12%)	Palustrine Scrub-Shrub (1%)		100
Stream Process Groups	High Gradient-Contained (68%)	Moderate Gradient-Mixed Control (13%)	Moderate Gradient-Contained (6%)	Floodplain (5%)	Lake (3%)	
Land Use Designations	Mostly Natural Setting (42%)	Moderate Development (29%)	Intensive Development (29%)			100





West Chichagof Complex

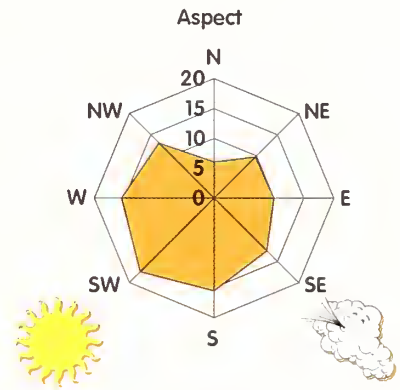
These rugged coastal highlands extend from Salisbury Sound to Portlock Harbor. This subsection is bordered on the west by wave-cut terraces along much of its length. Weakly metamorphosed greenstones, phyllites, and *graywackes* comprise most of the bedrock. A unique geologic feature is the Whitestripe Marble formation that strikes across the land with impressive sinkholes, vertical shafts, and caves. Rivers and streams that cross this formation often form cave systems such as the impressive Rust Creek cave northeast of Rust Lake. Past ice sheets ground down much of this landscape except for an occasional "*nunatak*" peak. Some of these peaks rise past 3,200 feet, such as Mounts Lydonia and Freeburn. However, these sharp-edged *nunataks* cover a relatively small proportion of the landscape, being concentrated mainly on the Khaz Peninsula. Glacial striations are very prominent on ridges between 1,500 and 3,000 feet. *High gradient contained streams* dissect this landscape. Scouring by ice has left numerous basins that now contain lakes and ponds. Alpine barrens, meadows, and rock outcrops make up a significant portion of the area. A mixture of productive hemlock-spruce and scrubby mixed conifer forests cover lower elevations. Common mammals include brown bear, Sitka black-tailed deer, marten (introduced), ermine, red squirrel (introduced), common shrew, Keen's mouse, and tundra and long-tailed vole.

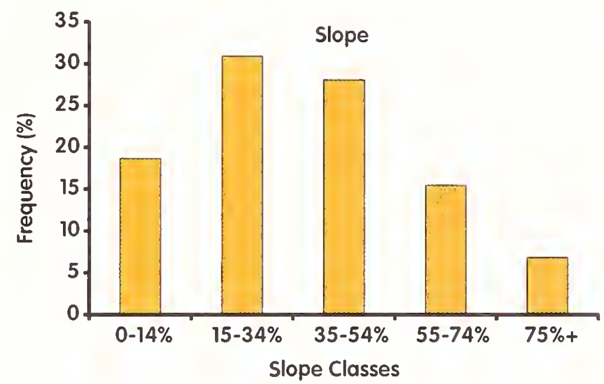


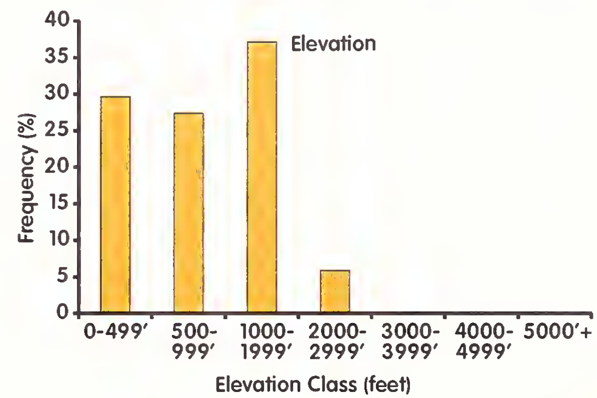
Land-Human Interactions. The Sitka Tlingits inhabited the coastline prior to European arrival. The rich marine environment supplied Natives with fish, seal, sea otter, fur seal, and seaweed. Abundant runs of sockeye salmon were found in Ford Arm. The discovery of gold led to the boomtowns of Chichagof and Kimshan Cove in the early 1900s. The waters of Rust Lake were tapped by underground tunnel to generate electricity for the nearby mines and towns. The cutting of accessible forests was undoubtedly heavy during the era of active mining. The Chichagof Mine is the second largest (after the Alaska-Juneau Mine) lode gold mine in Alaska. Mining activity has subsided in the past 50 years, and most of this subsection is now part of the West Chichagof-Yakobi Wilderness.

A fog bank, rolling in off the sea, further enhances the rugged nature of this subsection by cloaking the Outer Coast Wave-cut Terraces on the right. The gray colored mountain in the center of the photograph is Whitestripe Mountain, so named for a prominent band of marble running across this subsection.

West Chichagof Complex	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (68%)	Mountain Summits (22%)	Valley Floor (5%)	Lowlands (4%)		8
Parent Materials	Residuum (42%)	Bedrock (20%)	Colluvium (19%)	Volcanic Ejecta (8%)	Organic Material (7%)	8
Soils	Spodosols (58%)	Miscellaneous (20%)	Inceptisols (10%)	Histosols (7%)	Entisols (5%)	8
Landcover	Rock (18%)	Hemlock-Spruce (17%)	Mixed Conifer (15%)	Alpine (10%)	Other (9%)	100
Productivity	Nonproductive Forests (40%)	Nonforested (37%)	Productive Forests (22%)			100
Site Index	SI 0-40 (96%)	SI 61-80 (2%)	SI 41-60 (1%)	SI >80 (1%)		80
Wetlands	Upland (70%)	Palustrine Forested (13%)	Palustrine Emergent (12%)	Palustrine Scrub-Shrub (3%)	Lacustrine Limnetic (1%)	65
Stream Process Groups	High Gradient-Contained (61%)	Floodplain (9%)	Lake (7%)	Moderate Gradient-Mixed Control (7%)	Alluvial Fan (6%)	
Land Use Designations	Wilderness & Monument (93%)	Mostly Natural Setting (7%)	Private (1%)			100



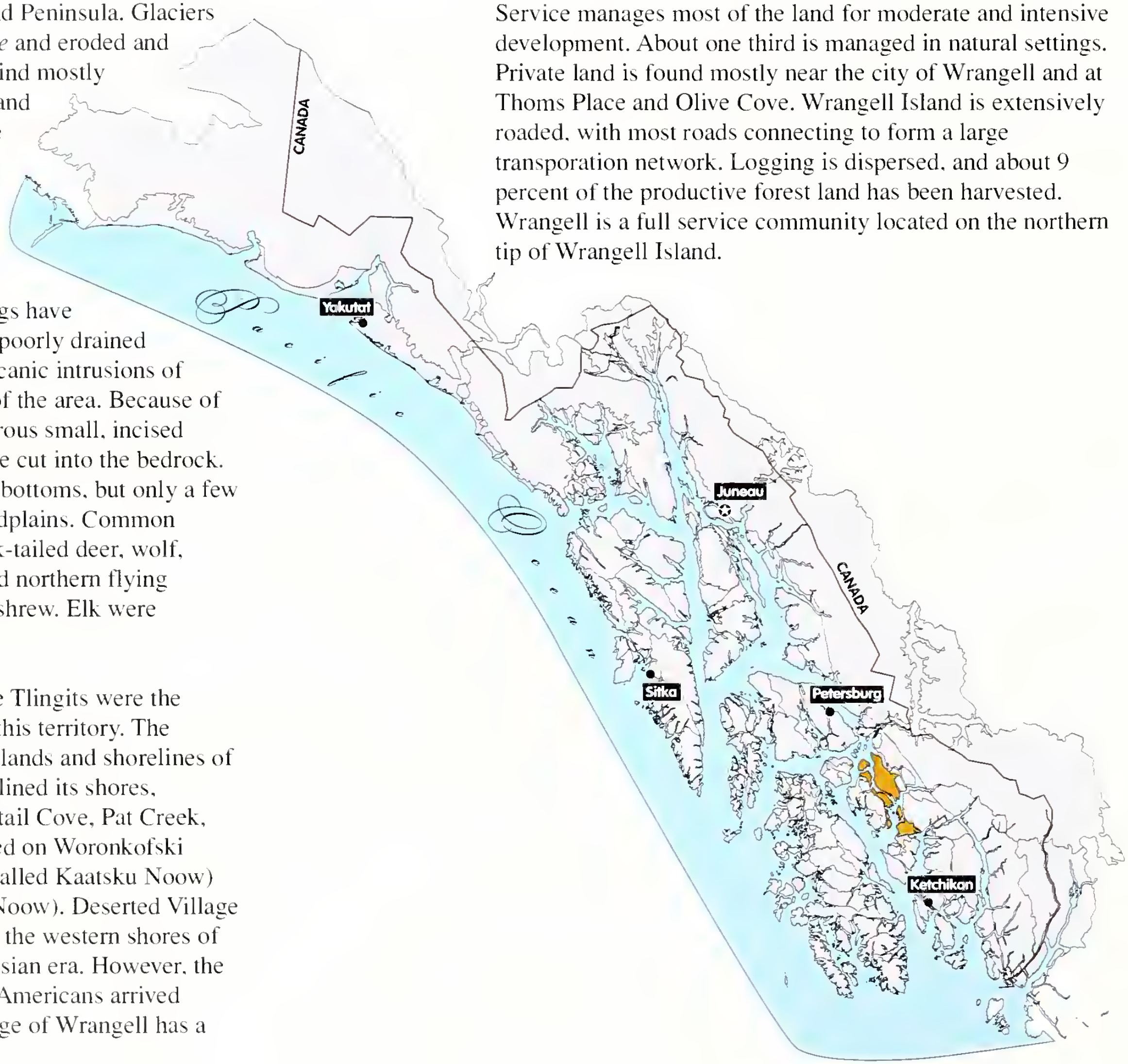


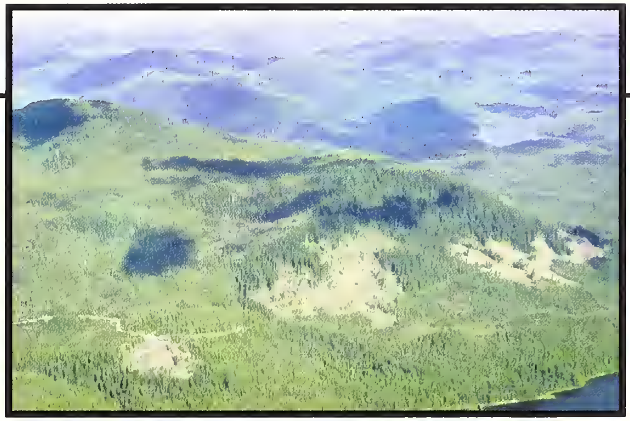


Zimovia Strait Complex

This subsection spans the entire length of Zimovia Strait from Woronkofski Island south through Etolin, Wrangell and Deer Islands to the central portion of Cleveland Peninsula. Glaciers inundated the land during the *Pleistocene* and eroded and reduced much of its surface, leaving behind mostly rounded ridge tops with steep sidewalls and broad U-shaped valleys. Alpine areas are small as most elevations are below 2,000 feet. The lower slopes are mostly forests of hemlock with some Sitka spruce and cedar. About half the landscape is productive forest land, with the rest in wetlands, mostly forested. Bogs have developed on organic soils underlain by poorly drained *till*. Stratified sedimentary rocks and volcanic intrusions of granodiorite and tonalite underlie most of the area. Because of the moderately high precipitation, numerous small, incised streams cascade from the slopes and have cut into the bedrock. Mountain streams coalesce in the valley bottoms, but only a few are large enough to develop modest floodplains. Common mammals include black bear, Sitka black-tailed deer, wolf, marten, porcupine, ermine, mink, red and northern flying squirrel, and common, dusky and water shrew. Elk were introduced on Etolin Island.

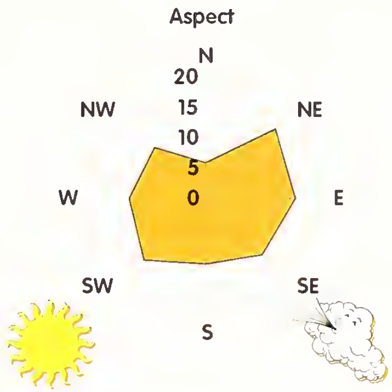
Land-Human Interactions. The Stikine Tlingits were the earliest known inhabitants over most of this territory. The Tlingits actively hunted and fished the islands and shorelines of Zimovia Strait. Fish camps and gardens lined its shores, including Anita Bay, Olive Cove, Whaletail Cove, Pat Creek, and Turn Island. Native forts were located on Woronkofski Island and at the mouths of Anita Bay (called Kaatsku Noow) and Southeast Cove (called Yeinakatan Noow). Deserted Village was once an important Native village on the western shores of Wrangell Island, thriving during the Russian era. However, the population moved to Wrangell after the Americans arrived (Goldschmidt and Haas 1998). The village of Wrangell has a rich cultural heritage, being occupied over time by Tlingits, Russians, British, and Americans. Today, the U.S. Forest Service manages most of the land for moderate and intensive development. About one third is managed in natural settings. Private land is found mostly near the city of Wrangell and at Thoms Place and Olive Cove. Wrangell Island is extensively roaded, with most roads connecting to form a large transporation network. Logging is dispersed, and about 9 percent of the productive forest land has been harvested. Wrangell is a full service community located on the northern tip of Wrangell Island.

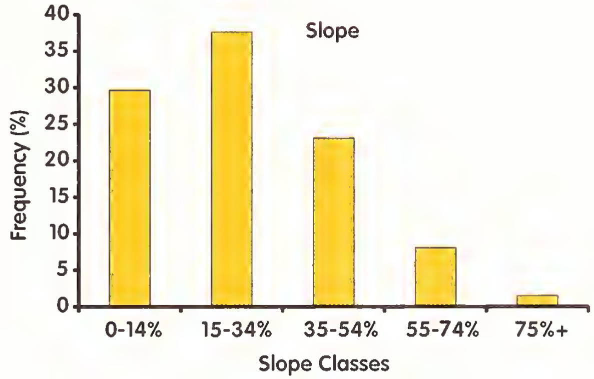


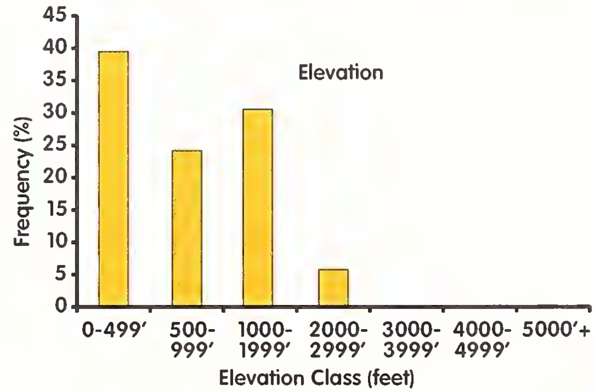


An east view of Wrangell Island just north of Nemo Point from over Zimovia Strait. The gentle relief and abundance of productive forests proved attractive to past road building and timber harvest, as seen in this photo. Roads connect this area to the community of Wrangell.

Zimovia Strait Complex	Ranked Order					% GRID reporting data
	1st	2nd	3rd	4th	5th	
Landforms	Mountain Slopes (47%)	Lowlands (39%)	Hills (8%)	Mountain Summits (3%)	Valley Floor (3%)	94
Parent Materials	Residuum (28%)	Colluvium (28%)	Ablation Till (18%)	Compact Till (10%)	Glacial Drift (9%)	65
Soils	Histosols (51%)	Spodosols (47%)	Inceptisols (1%)			94
Landcover	Hemlock (32%)	Lodgepole Pine (17%)	Hemlock-Spruce (15%)	Mixed Conifer (14%)	Brush (8%)	100
Productivity	Productive Forests (51%)	Nonproductive Forests (40%)	Nonforested (9%)			100
Site Index	SI 0-40 (38%)	SI 41-60 (28%)	SI 61-80 (27%)	SI >80 (8%)		95
Wetlands	Upland (50%)	Palustrine Forested (32%)	Palustrine Emergent (14%)	Palustrine Scrub-Shrub (2%)		100
Stream Process Groups	High Gradient-Contained (66%)	Moderate Gradient-Mixed Control (13%)	Moderate Gradient-Contained (7%)	Floodplain (6%)	Lake (3%)	
Land Use Designations	Moderate Development (34%)	Mostly Natural Setting (28%)	Intensive Development (26%)	Private (7%)	Wilderness & Monument (5%)	100







Volcanics

Volcanic rocks of basaltic and andesitic composition dominate these areas. These include flow rocks, *breccia*, *tuffs*, and rhyolites with interbeds of mudstone, conglomerate, minor carbonates, and regionally *metamorphosed* and *deformed* equivalents of these strata. These include greenschist, greenstone, phyllite, schist, and gneiss. These rocks predate the last major glacial advance and consequently have been overridden and shaped by the forces of ice. Glacial deposits are scattered throughout resulting in a mixture of glacial and volcanic soils. General landscape conditions (particularly vegetation patterns) tend to reflect the flow patterns of volcanic rocks. Drainage is controlled by geologic structure and bedding where present. Cliffs tend to form along geologic breaks, such as flow escarpments. Landslides often initiate at the soil-bedrock contact on steep slopes. Fine-grained soils derived from volcanic bedrocks are somewhat impermeable and often wet. As a result, vast areas of poorly drained wetland complexes and peatlands often occupy these landscapes. Volcanics tend to weather into angular fragments or flat rocks called "flags." Streambeds comprised of these substrates are poor habitat for spawning fish and aquatic invertebrates.


CANADA
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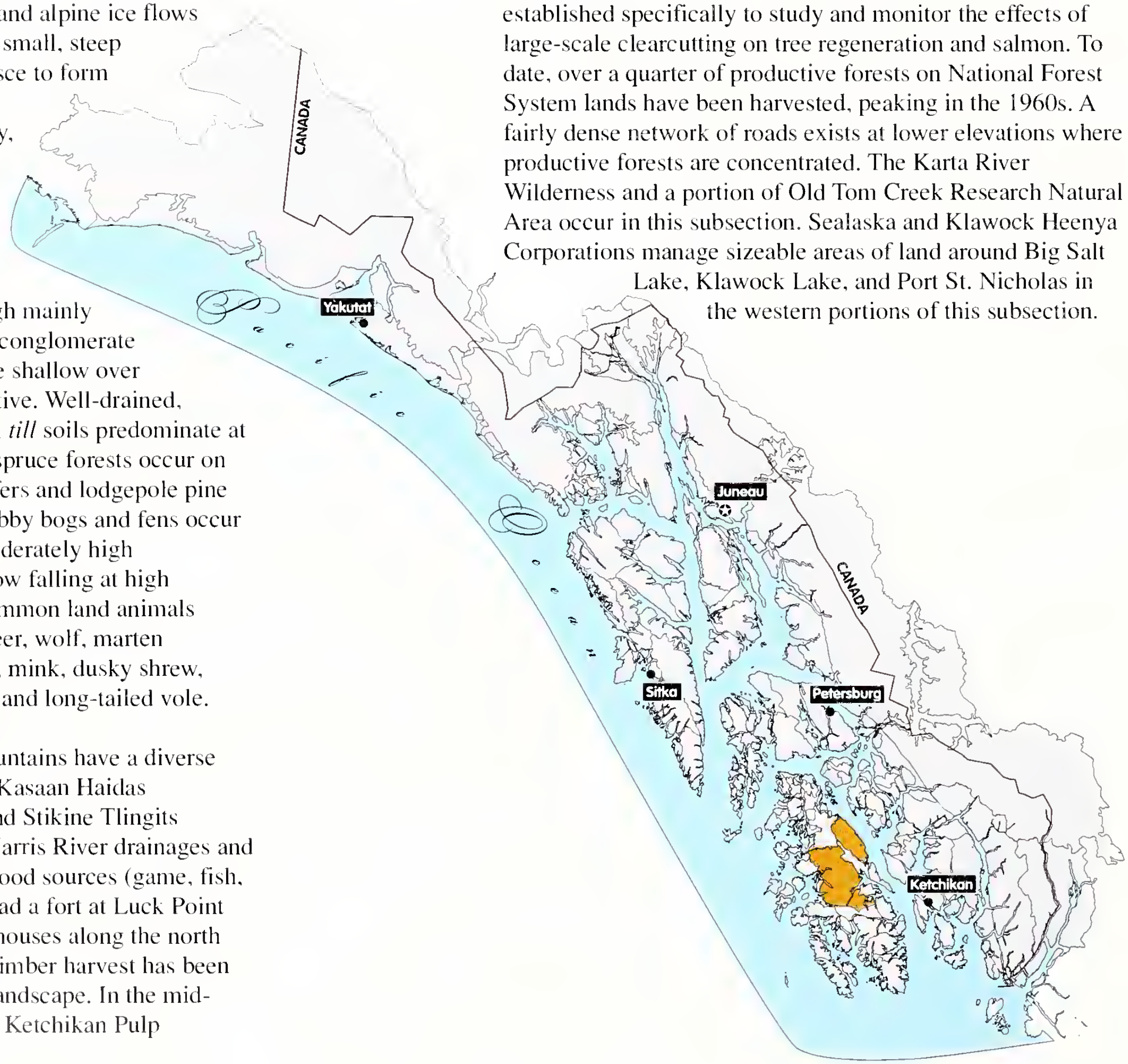
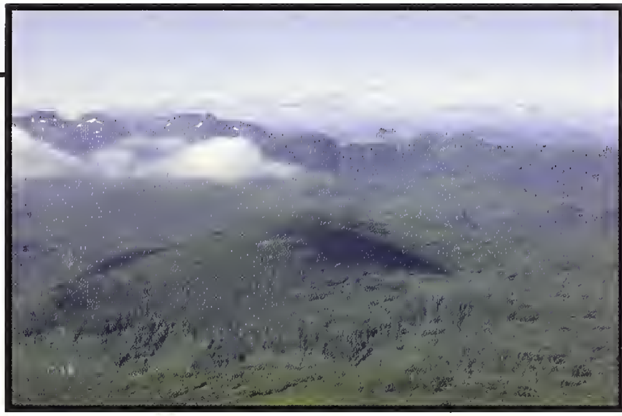
Central Prince of Wales Volcanics

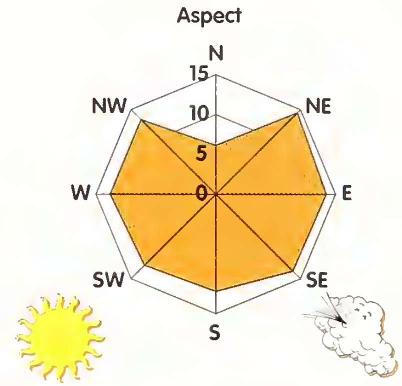
These rugged volcanic mountains form the central core of Prince of Wales Island. Here, the affects of past glaciation are complex, resulting from a mixture of continental and alpine ice flows (Conner and O'Haire 1988). Numerous small, steep valleys dissect the mountains and coalesce to form broad U-shaped valleys along larger drainages (Staney, Anderson, McGilvery, and Maybeso Creeks; Karta and Harris Rivers). Large U-shaped basins contain Big Salt Lake and Klawock Lake on the west side and head steep-sided *fjords* (Twelvemile Arm, Polk Inlet, and McKenzie Inlet) on the east side. Though mainly volcanic, some outcrops of dioritic and conglomerate rocks occur. At high elevations, soils are shallow over bedrock, often organic, and less productive. Well-drained, moderately to highly productive, glacial *till* soils predominate at low elevations. Hemlock and hemlock-spruce forests occur on well-drained sites, whereas mixed conifers and lodgepole pine forests occupy wetter areas. Open, shrubby bogs and fens occur on the wettest spots. Precipitation is moderately high throughout, with greater amounts of snow falling at high elevations during the winter season. Common land animals include black bear, Sitka black-tailed deer, wolf, marten (introduced), ermine, river otter, beaver, mink, dusky shrew, northern flying squirrel, Keen's mouse, and long-tailed vole.

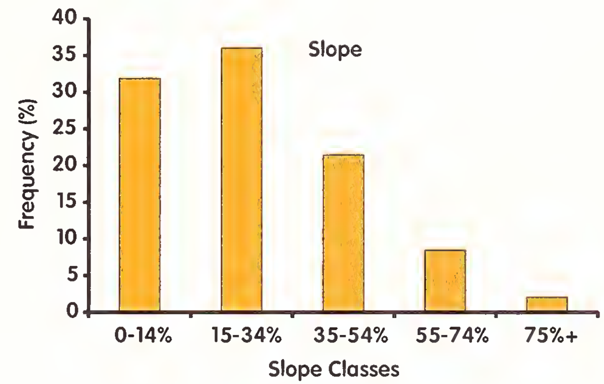
Land-Human Interactions. These mountains have a diverse cultural history, being inhabited by the Kasaan Haidas (southeast), Klawock Tlingits (west), and Stikine Tlingits (northeast). The Karta, Maybeso, and Harris River drainages and Karta and Hollis Bays were important food sources (game, fish, gardens) for the Kasaan. The Stikines had a fort at Luck Point (called Shis`gi Noow) and large smokehouses along the north shore of Thorne Bay. Since the 1950s, timber harvest has been the dominant human use affecting the landscape. In the mid-1950s, the first clearcut harvests for the Ketchikan Pulp Company occurred in the Maybeso Experimental Forest near Hollis (Rakestraw 1994). This experimental forest was established specifically to study and monitor the effects of large-scale clearcutting on tree regeneration and salmon. To date, over a quarter of productive forests on National Forest System lands have been harvested, peaking in the 1960s. A fairly dense network of roads exists at lower elevations where productive forests are concentrated. The Karta River Wilderness and a portion of Old Tom Creek Research Natural Area occur in this subsection. Sealaska and Klawock Heenya Corporations manage sizeable areas of land around Big Salt Lake, Klawock Lake, and Port St. Nicholas in the western portions of this subsection.

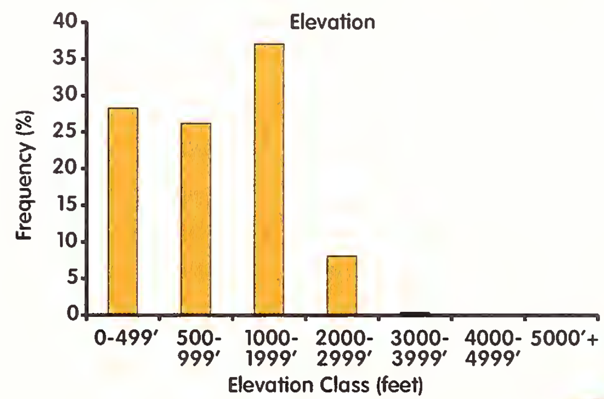




In the distance are the Central Prince of Wales Volcanics as viewed from the head of Twelve-mile Arm looking north toward the City of Hollis. Rugged volcanic mountains form the central core of Prince of Wales Island. Hemlock and hemlock-spruce forests occupy the well-drained mountain slopes, whereas mixed conifer forests occupy the more undulating and nearly level landscape.



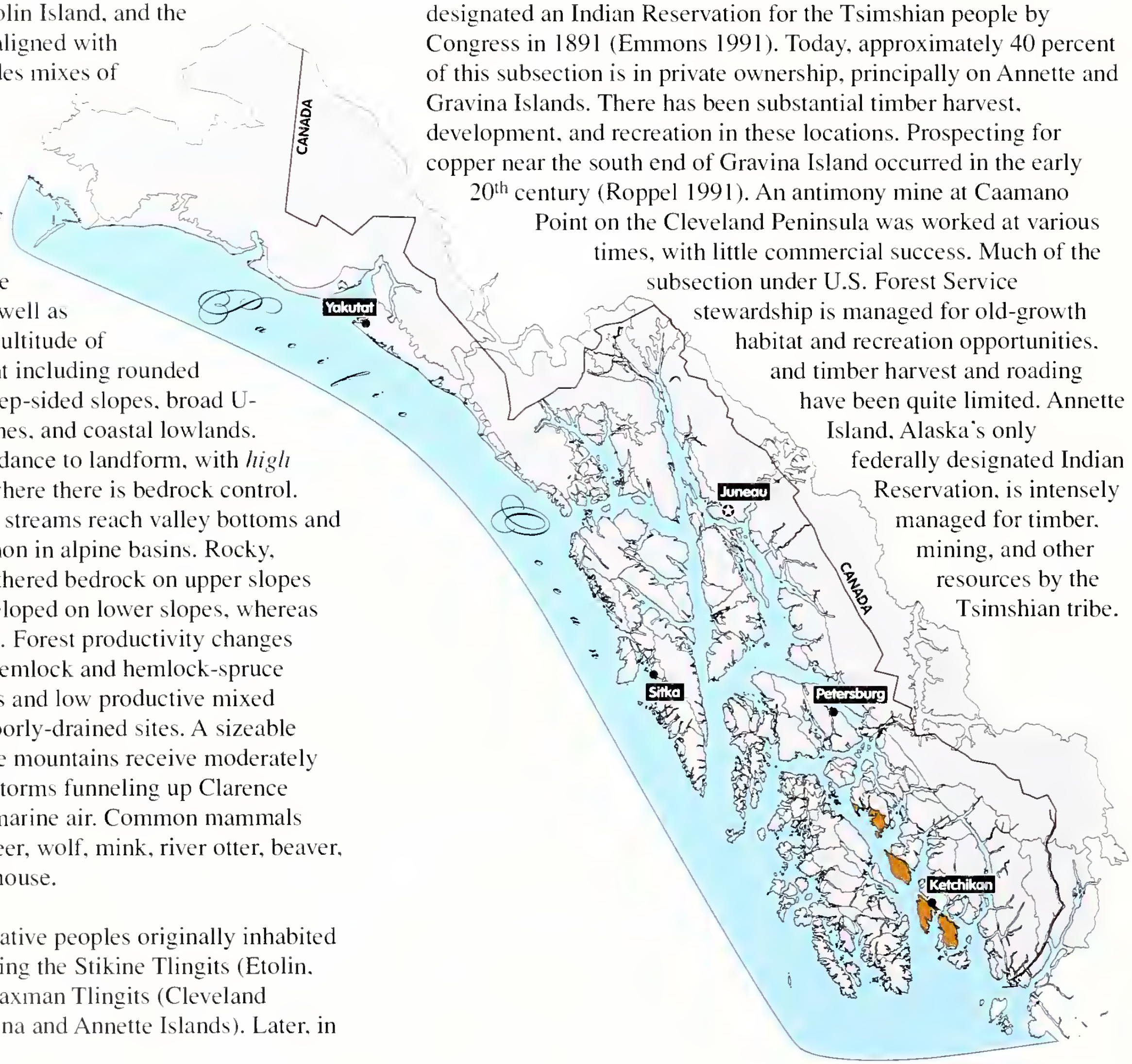




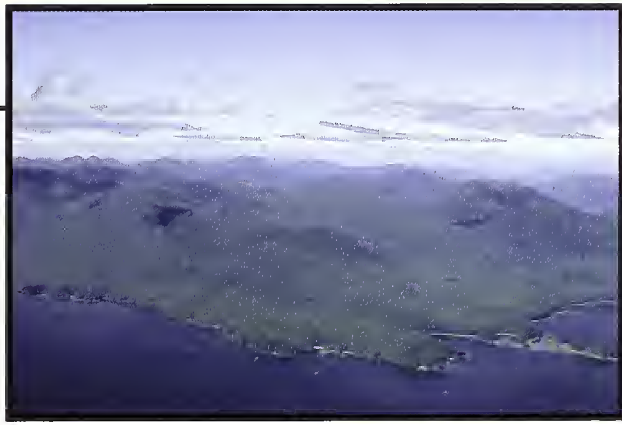
Central POW Volcanics	Ranked Order					% GRID reporting data
	1st	2nd	3rd	4th	5th	
Landforms	Mountain Slopes (42%)	Hills (24%)	Valley Floor (22%)	Mountain Summits (10%)	Lowlands (2%)	48
Parent Materials	Organic Material (47%)	Compact Till (30%)	Colluvium (8%)	Alluvial (7%)	Bedrock (6%)	46
Soils	Histosols (50%)	Spodosols (37%)	Entisols (7%)	Miscellaneous (6%)	Inceptisols (1%)	48
Landcover	Hemlock (25%)	Hemlock-Spruce (21%)	Other (13%)	Mixed Conifer (11%)	Lodgepole Pine (8%)	100
Productivity	Productive Forests (54%)	Nonproductive Forests (30%)	Nonforested (16%)			99
Site Index	SI 0-40 (32%)	SI >80 (32%)	SI 41-60 (19%)	SI 61-80 (17%)		76
Wetlands	Upland (62%)	Palustrine Forested (20%)	Palustrine Emergent (13%)	Palustrine Scrub-Shrub (4%)	Lacustrine Limnetic (1%)	100
Stream Process Groups	High Gradient-Contained (74%)	Moderate Gradient-Mixed Control (7%)	Floodplain (6%)	Moderate Gradient-Contained (5%)	Lake (3%)	
Land Use Designations	Intensive Development (33%)	Mostly Natural Setting (25%)	Moderate Development (19%)	Private (15%)	Wilderness & Monument (8%)	100

Clarence Strait Volcanics

These volcanic mountains lie along the east side of Clarence Strait over much of its length, and include Annette Island, Gravina Island, western portions of Cleveland Peninsula and Etolin Island, and the Kashevarof Islands. This subsection is aligned with Gravina Belt Rocks and, as such, includes mixes of *plutonic* and other rocks (e.g., Annette Island). The general slope of the land faces either southwest (towards the channel) or northeast—directions perpendicular to the main orientation of ridgelines. These mountains have been smoothed and sheared by continental ice sheets moving down Clarence Strait as well as coalescing alpine glaciers. As such, a multitude of glacially modified landforms are present including rounded mountains with *hanging valleys* and steep-sided slopes, broad U-shaped valleys, bedrock-scoured faultlines, and coastal lowlands. Streams change their character in accordance to landform, with *high gradient contained streams* occurring where there is bedrock control. Gradient and containment lessen where streams reach valley bottoms and coastal lowlands. Large lakes are common in alpine basins. Rocky, shallow soils have developed from weathered bedrock on upper slopes and ridgetops. *Colluvial* soils have developed on lower slopes, whereas organic and *till* soils reside on lowlands. Forest productivity changes with drainage, with highly productive hemlock and hemlock-spruce forests occurring on well-drained slopes and low productive mixed conifer and lodgepole pine stands on poorly-drained sites. A sizeable portion of the area is nonforested. These mountains receive moderately high amounts of precipitation through storms funneling up Clarence Strait and the orographic lift of moist, marine air. Common mammals include black bear, Sitka black-tailed deer, wolf, mink, river otter, beaver, red squirrel, dusky shrew, and Keen's mouse.

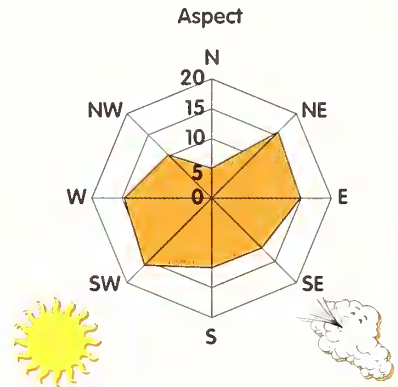


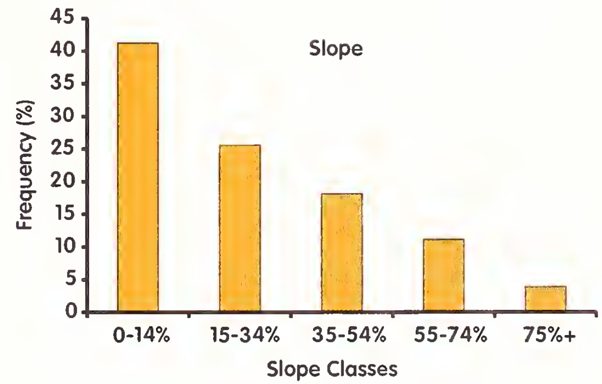
Land-Human Interactions. Various Native peoples originally inhabited the coastlines of Clarence Strait, including the Stikine Tlingits (Etolin, Onslow, and the Kashevarof Islands), Saxman Tlingits (Cleveland Peninsula), and Tongass Tlingits (Gravina and Annette Islands). Later, in the 1800s, the Metlakatla Tsimshian, led by Father Duncan, crossed over from Canada and settled on Annette Island. This island was designated an Indian Reservation for the Tsimshian people by Congress in 1891 (Emmons 1991). Today, approximately 40 percent of this subsection is in private ownership, principally on Annette and Gravina Islands. There has been substantial timber harvest, development, and recreation in these locations. Prospecting for copper near the south end of Gravina Island occurred in the early 20th century (Roppel 1991). An antimony mine at Caamano Point on the Cleveland Peninsula was worked at various times, with little commercial success. Much of the subsection under U.S. Forest Service stewardship is managed for old-growth habitat and recreation opportunities, and timber harvest and roading have been quite limited. Annette Island, Alaska's only federally designated Indian Reservation, is intensely managed for timber, mining, and other resources by the Tsimshian tribe.

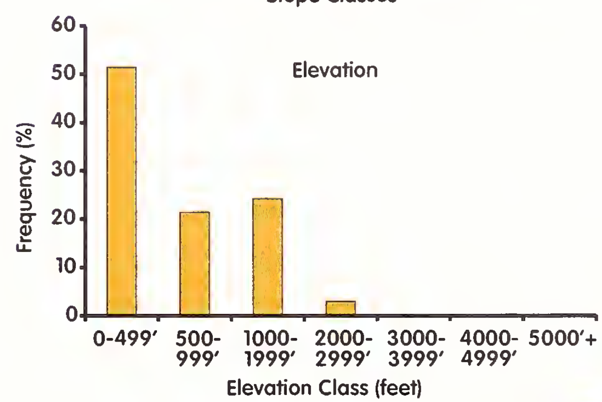


Cleveland Peninsula, seen here, is part of a northwest band of rocks called the Gravina Belt Rocks. This subsection lies on the east side of Clarence Strait along most of its length. Ridgelines follow a northwest trend, with U-shaped valleys and coastal lowlands illustrating the carving action of continental glaciers. Productive forests occupy the mountain slopes, while mixed conifer forests and open wetlands occupy the lowlands.

Clarence Strait Volcanics	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (42%)	Lowlands (17%)	Valley Floor (16%)	Hills (16%)	Mountain Summits (6%)	55
Parent Materials	Residuum (33%)	Colluvium (21%)	Organic Material (17%)	Ablation Till (10%)	Compact Till (8%)	40
Soils	Histosols (44%)	Spodosols (43%)	Inceptisols (11%)	Entisols (2%)		55
Landcover	Brush (39%)	Hemlock (22%)	Mixed Conifer (12%)	Hemlock-Spruce (12%)	Lodgepole Pine (7%)	100
Productivity	Nonforested (41%)	Productive Forests (34%)	Nonproductive Forests (24%)			100
Site Index	SI >80 (53%)	SI 41-60 (22%)	SI 0-40 (13%)	SI 61-80 (12%)		97
Wetlands	Upland (50%)	Palustrine Forested (35%)	Palustrine Scrub-Shrub (7%)	Palustrine Emergent (4%)	Lacustrine Limnetic (2%)	100
Stream Process Groups	High Gradient-Contained (47%)	Moderate Gradient-Contained (15%)	Moderate Gradient-Mixed Control (13%)	Floodplain (10%)	Lake (6%)	
Land Use Designations	Private (40%)	Mostly Natural Setting (34%)	Wilderness & Monument (15%)	Intensive Development (7%)	Moderate Development (5%)	100



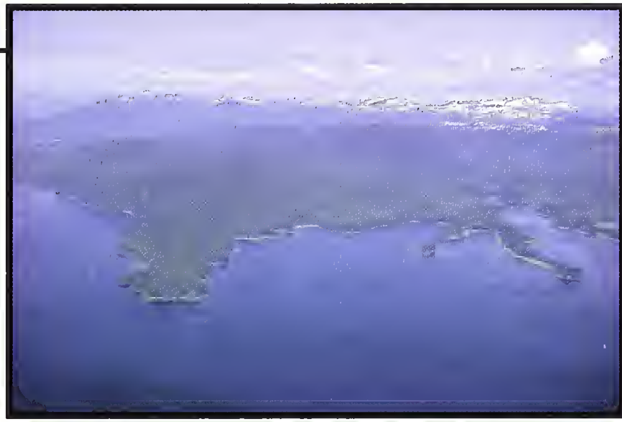




South Admiralty Volcanics

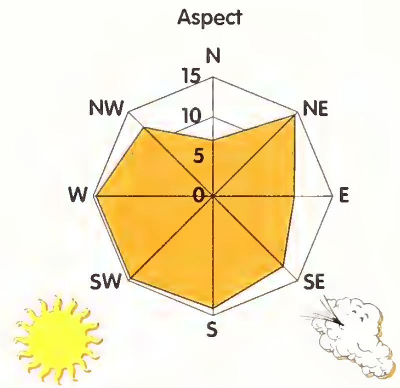
The southern tip of Admiralty Island consists of Tertiary-age basalt and andesite flows that incline at roughly 25 degrees. There are a few outcrops of older rock within this subsection along the perimeter. The most notable is near Murder Cove where *graywacke*, slate, and limestone outcrop (Lathram et al. 1965). *High-gradient contained channel types* make up about 60 percent of the mapped channels, which is typical for the higher relief islands in the *archipelago*. The *terrain* is comprised of extensive areas of high-elevation plateaus or benchlands lined by steep scarps along lava flow edges. These high-elevation plateaus are a unique landscape feature in Southeast Alaska. Organic soils are common on gently-sloping volcanic flows. About 30 percent of this subsection is wetland, with many occurring on plateaus. Valleys have been modified by glaciation, and larger bays such as Whitewater Bay and Eliza Harbor have fairly extensive floodplains. Subalpine community types make up almost 20 percent of the area. Productive western hemlock and hemlock-spruce forests occur along steeper slopes at the edges of volcanic flows. Common land animals include brown bear, Sitka black-tailed deer, marten, ermine, mink, dusky shrew, red squirrel, Keen's mouse, and meadow and long-tailed vole.

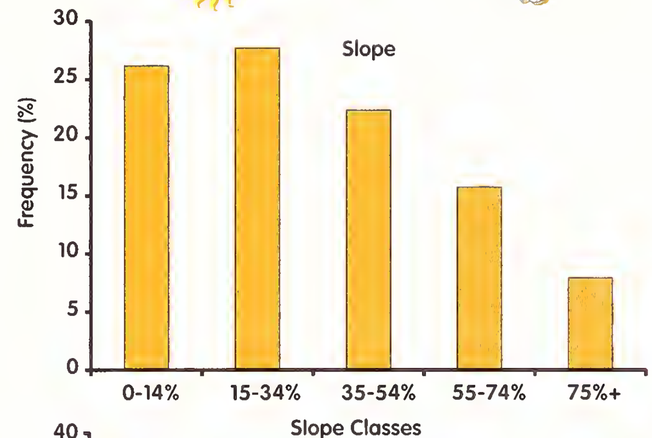
Land-Human Interactions. The Angoon Tlingits originally inhabited most of the area except for Pybus Bay, which was occupied by Kake Tlingits. All the large bays and coves on south Admiralty Island had Native camps and smokehouses. Subsistence activities included processing halibut and salmon, gathering seaweed, crabs and clams, preserving berries, rendering herring oil, trapping land otter and mink, and hunting deer, bear, and seal. A Tlingit village of Neltushkin was located in Whitewater Bay until abandonment in the 1900s. The rich resources and strategic location of the southern tip of Admiralty Island attracted early Europeans. Since the mid-1800s, small exposed beds of coal drew sailors and miners to Surprise Harbor and Murder Cove. Commercial attempts of developing these coal seams proved unsuccessful though. A Native camp, called Kúchx`a Héen, developed into a whaling station and then a cannery at Tyee in Murder Cove. A private lodge now resides there. Before this area was declared a wilderness in 1980, logging occurred in Whitewater Bay, Chapin Bay, and Eliza Harbor. About 2,000 acres were harvested in the 1960s. Timber harvests of 600 acres occurred in Whitewater Bay in the early 1900s (see photo on p. 25 of Rakestraw 1994). This subsection is currently in the Kootznoowoo Wilderness within the Admiralty Island National Monument.

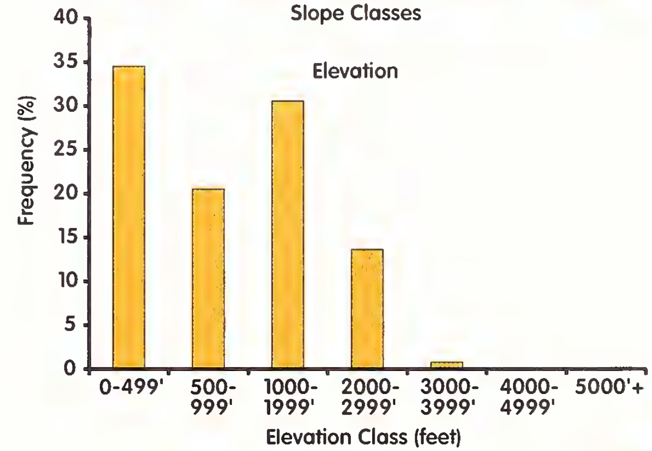


The southern tip of Admiralty Island looking north. From left to right are Point Gardner, Surprise Harbor, Bartlett Point, and Murder Cove. The rolling nature of the andesitic basalt flows is evident in this photograph. High-elevation plateaus formed by old lava flows comprise the higher country in the background. Along the ridge of Point Gardner are numerous wind-generated stands, not surprising given its very exposed location. Western hemlock-yellow cedar forests cover the lowlands along Surprise Harbor.

South Admiralty Volcanics	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms						0
Parent Materials						0
Soils						0
Landcover	Hemlock (34%)	Hemlock-Spruce (21%)	Alpine (14%)	Other (13%)	Lodgepole Pine (6%)	100
Productivity	Productive Forests (56%)	Nonproductive Forests (29%)	Nonforested (15%)			100
Site Index						0
Wetlands	Upland (55%)	Palustrine Forested (17%)	Palustrine Unconsolidated Bottom (16%)	Palustrine Emergent (9%)	Palustrine Scrub-Shrub (2%)	100
Stream Process Groups	High Gradient-Contained (64%)	Floodplain (12%)	Moderate Gradient-Contained (9%)	Moderate Gradient-Mixed Control (7%)	Estuary (3%)	
Land Use Designations	Wilderness & Monument (100%)					100



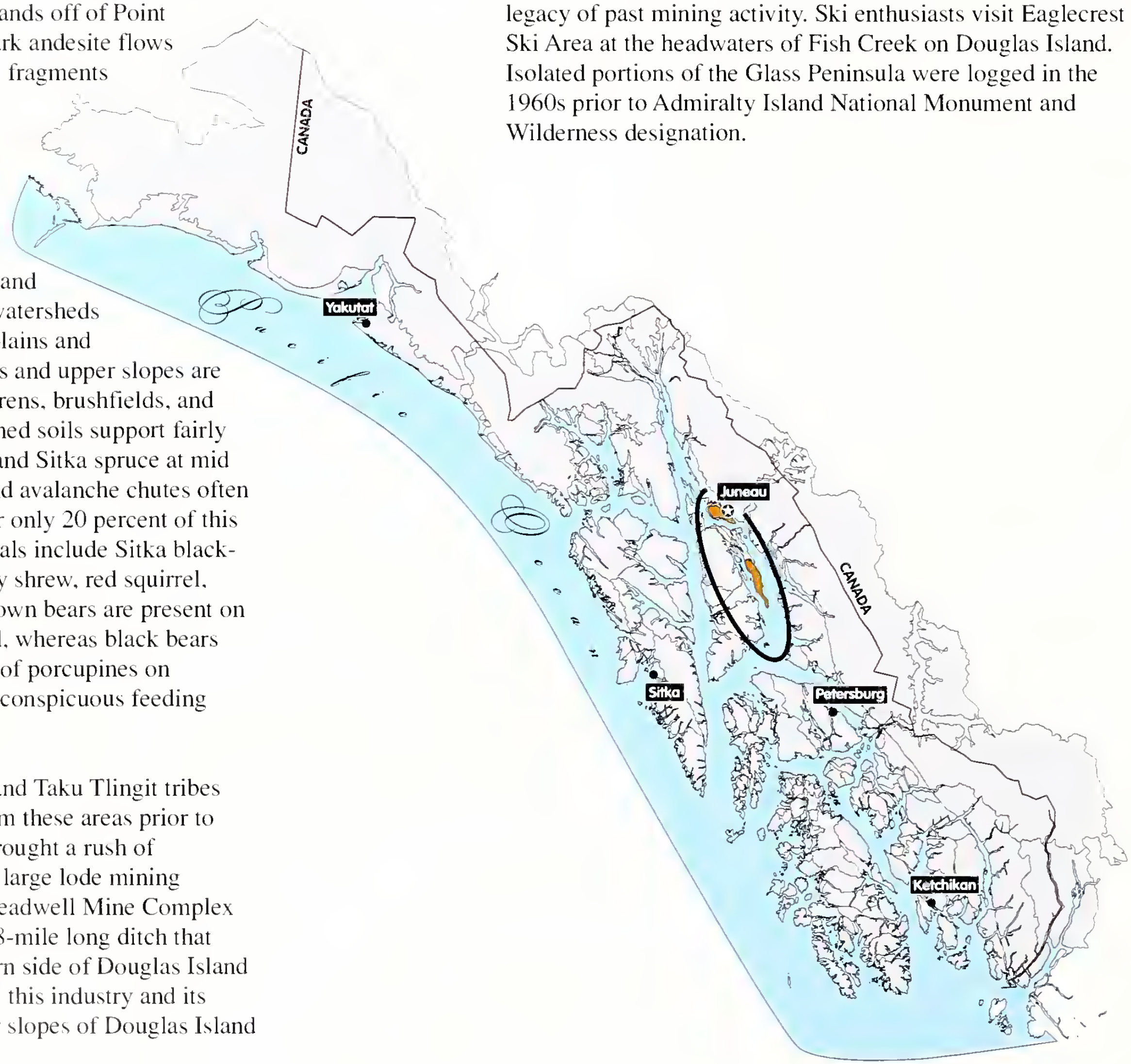


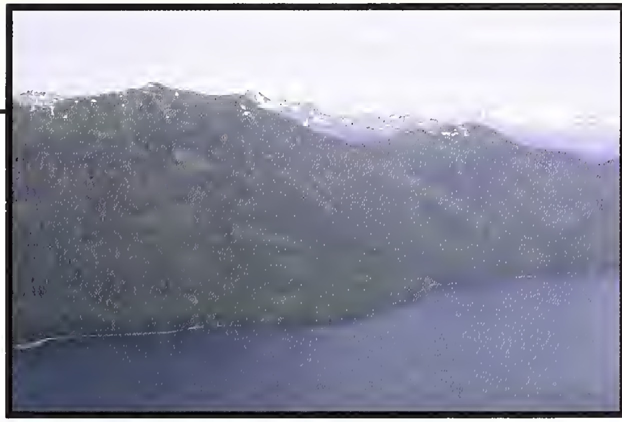


Stephens Passage Volcanics

Jurassic- and Cretaceous-age volcanic *breccias* underlie most of Douglas Island, the southern half of the Glass Peninsula on Admiralty Island, and The Brothers (islands off of Point Pybus). The rocks are predominately dark andesite flows composed of broken and fused volcanic fragments and ash (Conner and O'Haire 1988). Metamorphosed schists, slates, and phyllites line the eastern sides of Douglas Island and Glass Peninsula. Continental glaciation has shaped this area into rounded mountains draped by *colluvial* slopes. Slopes are fairly steep and deeply incised by swift streams. Most watersheds are quite small with very limited floodplains and coastal *estuarine* habitats. Mountaintops and upper slopes are vegetated with alpine meadows and barrens, brushfields, and stunted "*krummholz*" forests. Well-drained soils support fairly productive forests of western hemlock and Sitka spruce at mid and low elevations. Brushy landslide and avalanche chutes often dissect steep sideslopes. Wetlands cover only 20 percent of this very rough *terrain*. Common land animals include Sitka black-tailed deer, marten, ermine, mink, dusky shrew, red squirrel, Keen's mouse, and long-tailed vole. Brown bears are present on the Glass Peninsula of Admiralty Island, whereas black bears exist on Douglas Island. An abundance of porcupines on Douglas Island is evident through their conspicuous feeding habits (debarking of tree boles).

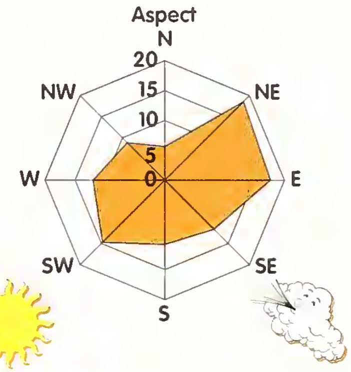
Land-Human Interactions. The Auk and Taku Tlingit tribes hunted, fished, and gathered berries from these areas prior to European contact. Major gold strikes brought a rush of Europeans in the late 1800s. Of several large lode mining operations, the most notable was the Treadwell Mine Complex with its 240- and 300-stamp mill and 18-mile long ditch that collected stream waters along the eastern side of Douglas Island (Conner and O'Haire 1988). To support this industry and its workers with timber and fuel, the lower slopes of Douglas Island were extensively logged in the late 1800s and early 1900s. Large portions of Douglas Island are still privately owned—a legacy of past mining activity. Ski enthusiasts visit Eaglecrest Ski Area at the headwaters of Fish Creek on Douglas Island. Isolated portions of the Glass Peninsula were logged in the 1960s prior to Admiralty Island National Monument and Wilderness designation.

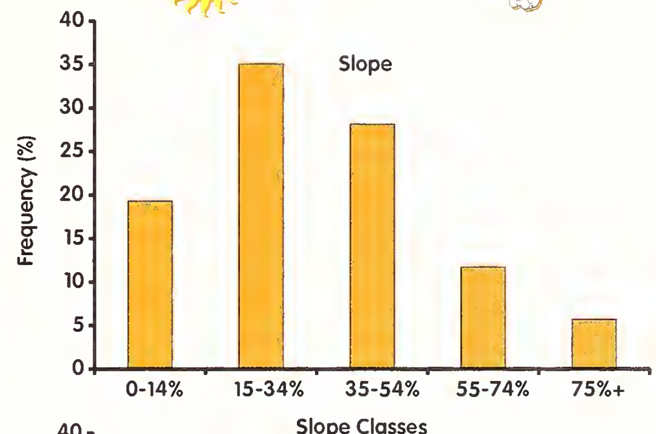


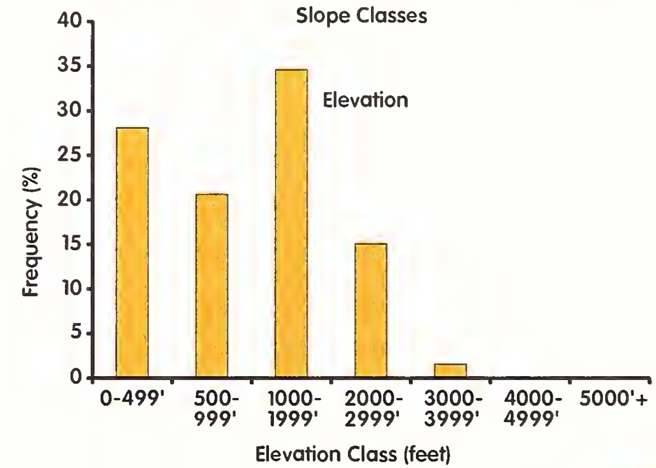


Looking east from Stephens Passage, the glaciated landscape of southern Douglas Island is framed by the higher Boundary Ranges Icefields in the background. These rounded volcanics are capped by alpine meadows and barrens and speckled with stunted mountain hemlock forests. Steep mountain slopes are forested with hemlock and Sitka spruce and dissected by avalanche chutes.

Stephens Passage Volcanics	Ranked Order					% GRID reporting data
	1st	2nd	3rd	4th	5th	
Landforms	Mountain Slopes (47%)	Mountain Summits (36%)	Valley Floor (9%)	Lowlands (5%)	Hills (3%)	27
Parent Materials	Colluvium (54%)	Bedrock (36%)	Organic Material (8%)	Glacial Till (1%)	Alluvial (1%)	27
Soils	Spodosols (46%)	Histosols (36%)	Inceptisols (17%)			27
Landcover	Hemlock (41%)	Hemlock-Spruce (21%)	Alpine (15%)	Lodgepole Pine (6%)	Landslides (6%)	100
Productivity	Productive Forests (62%)	Nonproductive Forests (26%)	Nonforested (12%)			100
Site Index	SI 0-40 (44%)	SI 41-60 (31%)	SI 61-80 (19%)	SI >80 (6%)		42
Wetlands	Upland (80%)	Palustrine Forested (13%)	Palustrine Emergent (4%)	Palustrine Scrub-Shrub (2%)		100
Stream Process Groups	High Gradient-Contained (80%)	Moderate Gradient-Contained (9%)	Moderate Gradient-Mixed Control (6%)	Floodplain (2%)	Estuary (1%)	
Land Use Designations	Wilderness & Monument (58%)	Mostly Natural Setting (27%)	Private (15%)			100







Hills

These rolling terrains have been heavily scoured and eroded by ice sheets. Although unconsolidated sediments had been deposited in various places, much of the landscape is bedrock controlled. Because of their low-lying nature (mostly below 2,000 feet), forests often blanket the entire land surface with little or no interruption by alpine and subalpine communities. Species dependent on alpine habitats are infrequent on these landscapes. Because of their low elevation, snow cover tends to be less and snowfields are absent relative to high mountains. Furthermore, streams are less affected by meltwater runoff and more dependent on seasonal precipitation.


CANADA
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Sitka
Petersburg
Ketchikan

Granitics

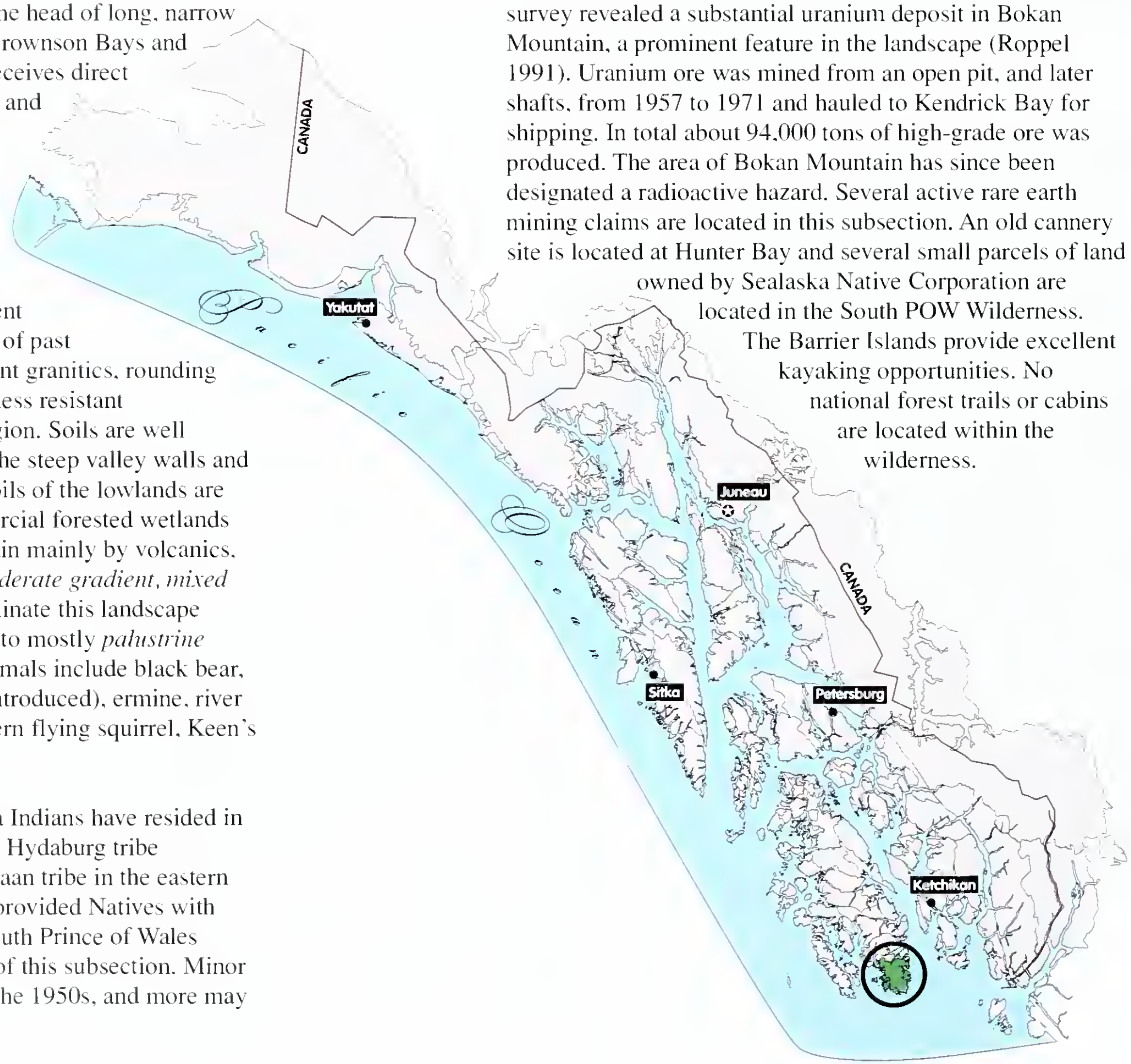
Plutonic bodies scattered across Southeast Alaska are a result of *allochthonous terranes* (such as island arc remnants of the Pacific Plate) colliding into the North American continent. One effect of these collisions was the formation of large *magma* chambers at depth. From these chambers molten rock rose in the earth's crust and cooled into coarse-grained rock. These rocks are gray in appearance and consist of well-developed mineral grains (quartz, feldspar, hornblende, and micas) that are generally large enough to see. Granitic rocks are highly resistant to erosion and prone to *exfoliation*. The granular materials originating from granite weathering are prone to erosion and soils are often shallow, gravelly, and nutrient poor. Shallow, well-drained organic soils often develop over granitic bedrocks in gently sloping *terrain*. Due to soil infertility, vegetation tends to be less robust and scrubby, and low-productive forests are common. Except where faults or fractures occur, most granitic areas tend to be shallowly incised by streams due to their resistance to physical and chemical weathering. Granitic-based streams often have well-rounded bedloads and relatively low pH levels, alkalinity, and dissolved solute concentrations (Wissmar et al. 1997), resulting in lower primary production for aquatic biota.

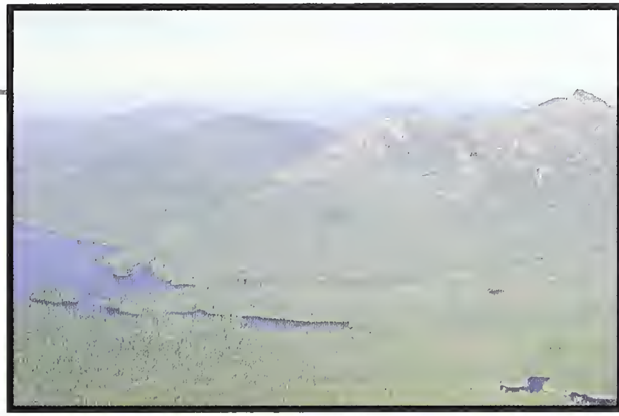

CANADA
Yakutat
Pacific Ocean
Juneau
CANADA
Sitka
Petersburg
Ketchikan

South Prince of Wales Granitics

This area encompasses the southern tip of Prince of Wales Island and offshore Barrier Islands. The landscape is characterized by small, moderately steep watersheds at the head of long, narrow *fjords* such as Kendrick, Nichols, and Brownson Bays and McLean Arm. The southern coastline receives direct oceanic influence from Dixon Entrance and its profile is quite jagged with abundant bays and coves formed by the intense wave action of the open ocean. Precipitation is moderately high. The landscape is a mosaic of rolling hills and lowlands dotted with hundreds of lakes and ponds that lie among prominent rounded mountains. The carving action of past glaciation scoured the tough and resistant granitics, rounding their summits while mowing down the less resistant metasediments and volcanics of this region. Soils are well drained and moderately productive on the steep valley walls and valley bottoms; however, most of the soils of the lowlands are poorly drained and support non-commercial forested wetlands and bogs. Soils are shallow and underlain mainly by volcanics, quartz diorite, and *graywackes*. The *moderate gradient, mixed control and contained streams* that dominate this landscape carry coarse- to fine-grained sediments to mostly *palustrine channels* downslope. Common land animals include black bear, Sitka black-tailed deer, wolf, marten (introduced), ermine, river otter, beaver, mink, dusky shrew, northern flying squirrel, Keen's mouse, and long-tailed vole.

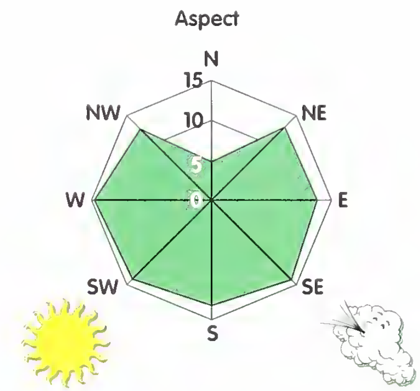
Land-Human Interactions. The Haida Indians have resided in this area since the early 1700s, with the Hydaburg tribe occupying the western half and the Kasaan tribe in the eastern half. Numerous bays, inlets, and islets provided Natives with rich marine resources. Presently, the South Prince of Wales Wilderness covers the western portion of this subsection. Minor amounts of timber harvest occurred in the 1950s, and more may be planned in a portion of this subsection. The remainder of the area is managed for mostly natural settings. A 1955 aerial survey revealed a substantial uranium deposit in Bokan Mountain, a prominent feature in the landscape (Roppel 1991). Uranium ore was mined from an open pit, and later shafts, from 1957 to 1971 and hauled to Kendrick Bay for shipping. In total about 94,000 tons of high-grade ore was produced. The area of Bokan Mountain has since been designated a radioactive hazard. Several active rare earth mining claims are located in this subsection. An old cannery site is located at Hunter Bay and several small parcels of land owned by Sealaska Native Corporation are located in the South POW Wilderness. The Barrier Islands provide excellent kayaking opportunities. No national forest trails or cabins are located within the wilderness.

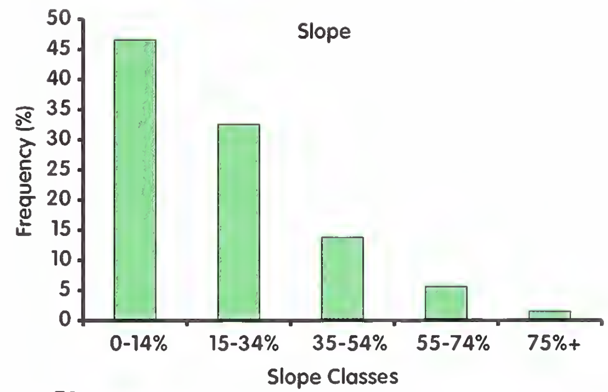


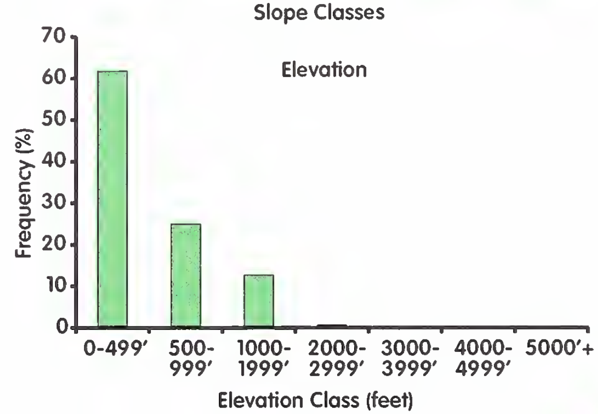


Bokan Mountain (right center) is a prominent granitic outcrop occurring within this subsection. The overall landscape is a mosaic of rounded hills and lowlands dotted with many lakes and ponds. Glacial activity scoured this landscape of tough resistant granitic rocks, leaving exposed plutons as hills while flattening the less resistant metasediments and volcanics. The South Arm of Moira Sound is seen on the left.

South POW Granitics	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (57%)	Valley Floor (18%)	Hills (15%)	Mountain Summits (9%)	Coastal (1%)	55
Parent Materials	Organic Material (32%)	Colluvium (30%)	Residuum (14%)	Compact Till (12%)	Glacial Drift (6%)	48
Soils	Histosols (41%)	Spodosols (40%)	Inceptisols (13%)	Entisols (3%)	Miscellaneous (3%)	55
Landcover	Mixed Conifer (28%)	Lodgepole Pine (21%)	Hemlock (19%)	Hemlock-Spruce (10%)	Rock (8%)	100
Productivity	Nonproductive Forests (56%)	Productive Forests (35%)	Nonforested (8%)			100
Site Index	SI 0-40 (51%)	SI 41-60 (27%)	SI 61-80 (17%)	SI >80 (5%)		99
Wetlands	Upland (51%)	Palustrine Forested (23%)	Palustrine Scrub-Shrub (21%)	Lacustrine Limnetic (2%)	Estuarine Intertidal (1%)	100
Stream Process Groups	High Gradient-Contained (45%)	Moderate Gradient-Contained (17%)	Lake (15%)	Moderate Gradient-Mixed Control (10%)	Palustrine (4%)	
Land Use Designations	Mostly Natural Setting (48%)	Wilderness & Monument (40%)	Intensive Development (12%)	Private (1%)		100

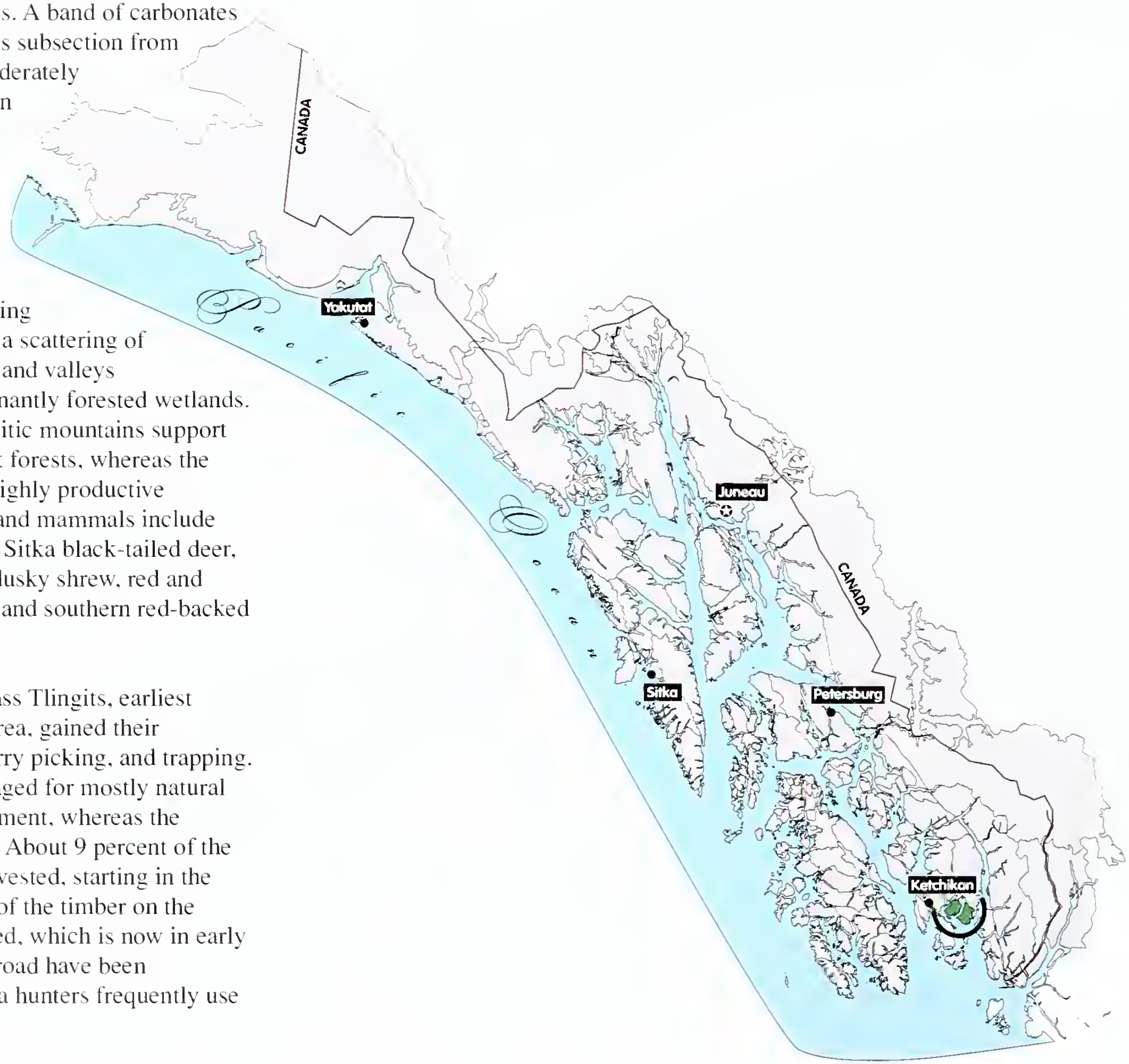




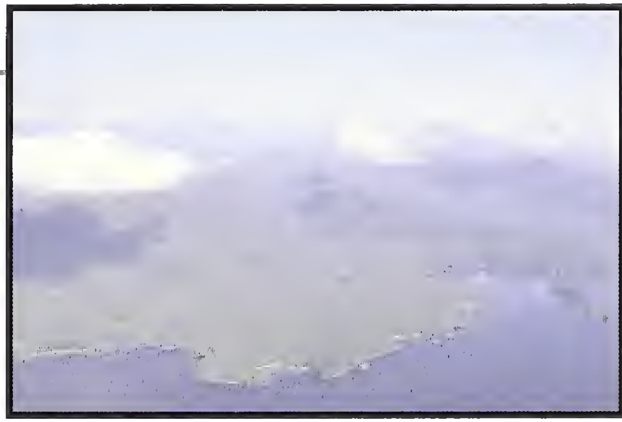


Thorne Arm Granitics

This subsection is located on the southern tip of the eastern half of Revillagigedo Island. The granitic *batholith* of this area is dominated by granodiorites and tonalites. A band of carbonates extends along the upper boundary of this subsection from Alava Bay northwest to Gnat Cove. Moderately steep mountain slopes up to 2,000 feet in elevation dominate the landscape. Topography varies from rounded mountain summits where granitics occur, to more deeply incised V-shaped drainages within the marbles and limestone. It is a landscape mosaic of mountain knobs protruding through rolling topography where glacial scour has left a scattering of small lakes and ponds. The rolling hills and valleys surrounding the mountains are predominantly forested wetlands. The moderately steep slopes of the granitic mountains support moderately productive western hemlock forests, whereas the steep slopes of the carbonates support highly productive hemlock and spruce forests. Common land mammals include black bear, mountain goat (introduced), Sitka black-tailed deer, wolf, marten, wolverine, common and dusky shrew, red and northern flying squirrel, Keen's mouse, and southern red-backed and long-tailed vole.

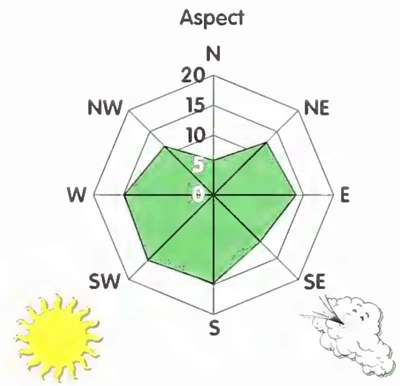


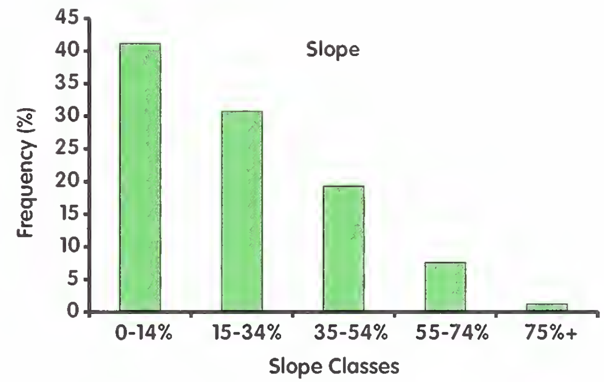
Land-Human Interactions. The Tongass Tlingits, earliest known inhabitants of the Thorne Arm area, gained their sustenance through fishing, hunting, berry picking, and trapping. Today, over half this subsection is managed for mostly natural settings, wilderness, and national monument, whereas the remainder is managed for development. About 9 percent of the highly productive forests have been harvested, starting in the 1960s and peaking in the 1990s. Much of the timber on the productive carbonates has been harvested, which is now in early successional stages. About 30 miles of road have been constructed in this landscape. Local area hunters frequently use this road system.

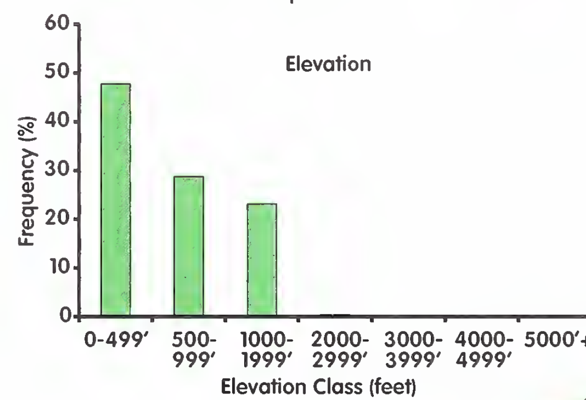


Rounded mountain summits protruding amongst rolling hills and lowlands is a typical scene of this subsection. Here, at Point Alava on Revillagigedo Island, the western hemlock forests of the mountains are surrounded by predominantly forested wetlands of the hills and lowlands. A band of carbonates in this subsection start at Alava Bay (far right center) and extends northwestward between the two mountains seen here.

Thorne Arm Granitics	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (80%)	Valley Floor (8%)	Mountain Summits (7%)	Hills (6%)		60
Parent Materials	Colluvium (53%)	Organic Material (28%)	Residuum (15%)	Alluvial (2%)	Bedrock (2%)	52
Soils	Spodosols (59%)	Histosols (37%)	Entisols (2%)	Miscellaneous (2%)	Inceptisols (1%)	60
Landcover	Hemlock (35%)	Mixed Conifer (21%)	Lodgepole Pine (18%)	Other (10%)	Hemlock-Spruce (9%)	100
Productivity	Productive Forests (48%)	Nonproductive Forests (48%)	Nonforested (4%)			100
Site Index	SI 0-40 (45%)	SI 61-80 (25%)	SI >80 (16%)	SI 41-60 (14%)		97
Wetlands	Palustrine Forested (45%)	Upland (40%)	Palustrine Scrub-Shrub (6%)	Palustrine Emergent (6%)	Lacustrine Limnetic (1%)	100
Stream Process Groups	High Gradient-Contained (54%)	Moderate Gradient-Mixed Control (11%)	Moderate Gradient-Contained (11%)	Lake (8%)	Floodplain (8%)	
Land Use Designations	Mostly Natural Setting (40%)	Intensive Development (30%)	Wilderness & Monument (19%)	Moderate Development (11%)	Private (1%)	100







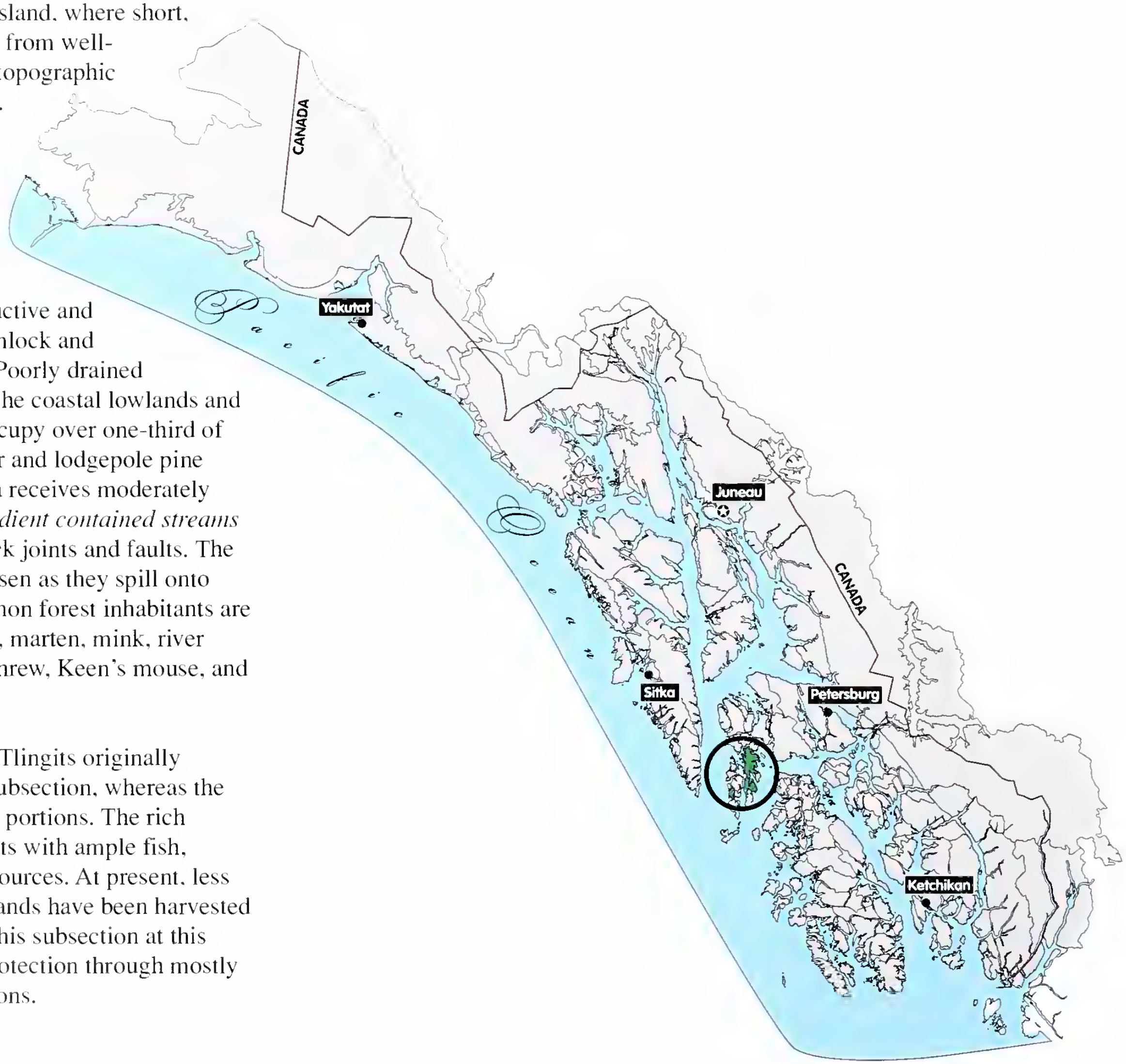
Sedimentary, Noncarbonates

Predominantly noncarbonate rocks underlie these areas. These include fine-grained sandstones (*graywacke*) and mudstones with minor amounts of limestone and conglomerate. These rocks weather differently from most, producing semi-angular fragments that break down easily into their component particles. Many planes of weaknesses exist in the rock type due to its formation (layering of sediments and structural joints and faulting). Glacial scour and drainage networks often follow geologic structure and bedding orientation. A mixture of forest types exists across the area as a function of drainage, aspect, and elevation. Soils reflect the original texture of the bedrock—for example, fine-textured soils result from siltstones and mudstones and coarse-textured soils from sandstones and conglomerates.

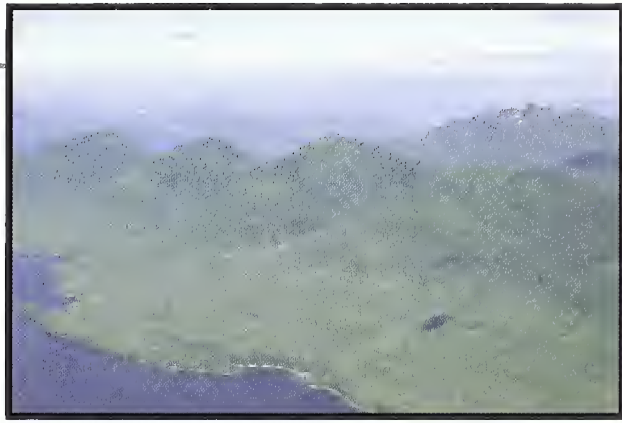
CANADA
Yakutat
Pacific Ocean
Juneau
CANADA
Sitka
Petersburg
Ketchikan

Alvin Bay Sediments

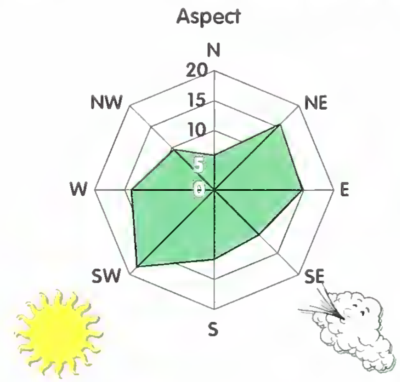
A series of rugged hills forms the spine of southcentral Kuiu Island from No Name Bay through Port Beauclerc. They also occur on the southwest corner of Kuiu Island, where short, broken, and irregular hillslopes descend from well-rounded summits to coastal lowlands—topographic features typical of heavy past glaciation. Sedimentary rocks of various grades of *graywackes* have glacial deposits smeared over much of them. Shallow to moderately deep soils occupy upper slopes and hilltops, whereas deeper *colluvial* soils occur along toe slopes. These well-drained soils are quite productive and support extensive forests of western hemlock and western hemlock-Alaska yellow cedar. Poorly drained mineral and organic soils occur among the coastal lowlands and on gentle hill slopes. These wet soils occupy over one-third of the landscape and support mixed conifer and lodgepole pine forests and marshy shrublands. The area receives moderately high amounts of precipitation. *High gradient contained streams* cascade down the hills following bedrock joints and faults. The gradient and containment of streams lessen as they spill onto coastal lowlands and floodplains. Common forest inhabitants are black bear, Sitka black-tailed deer, wolf, marten, mink, river otter, red squirrel, common and dusky shrew, Keen's mouse, and long-tailed vole.



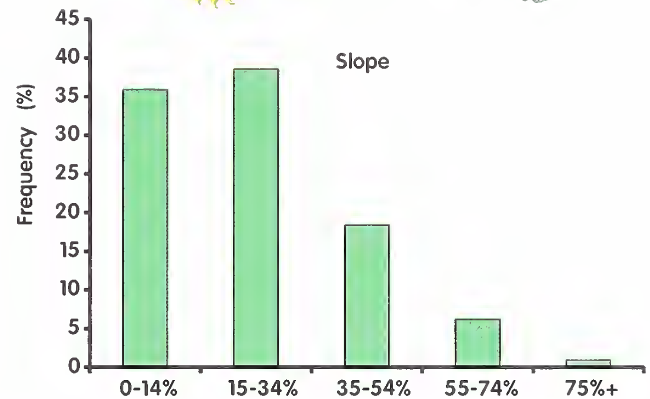
Land-Human Interactions. The Kake Tlingits originally inhabited the northern portions of this subsection, whereas the Klawock Tlingits occupied the southern portions. The rich marine environment provided the Tlingits with ample fish, shellfish, seaweed, and sea mammal resources. At present, less than 2 percent of the productive forest lands have been harvested for timber. No roads are maintained in this subsection at this time. The entire area has gained high protection through mostly natural setting and wilderness designations.

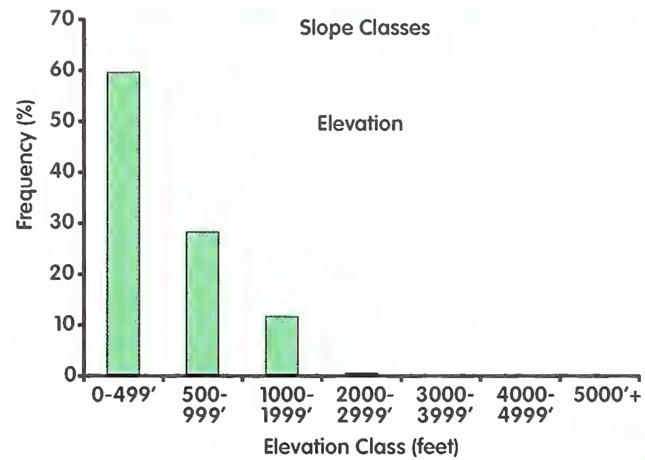


A view from over the north end of Affleck Canal near Bear Harbor looking to the northeast towards Port Beauclerc. The forested landscape is characterized by hills and low, rounded mountains that are often separated by lowlands and valley bottoms.



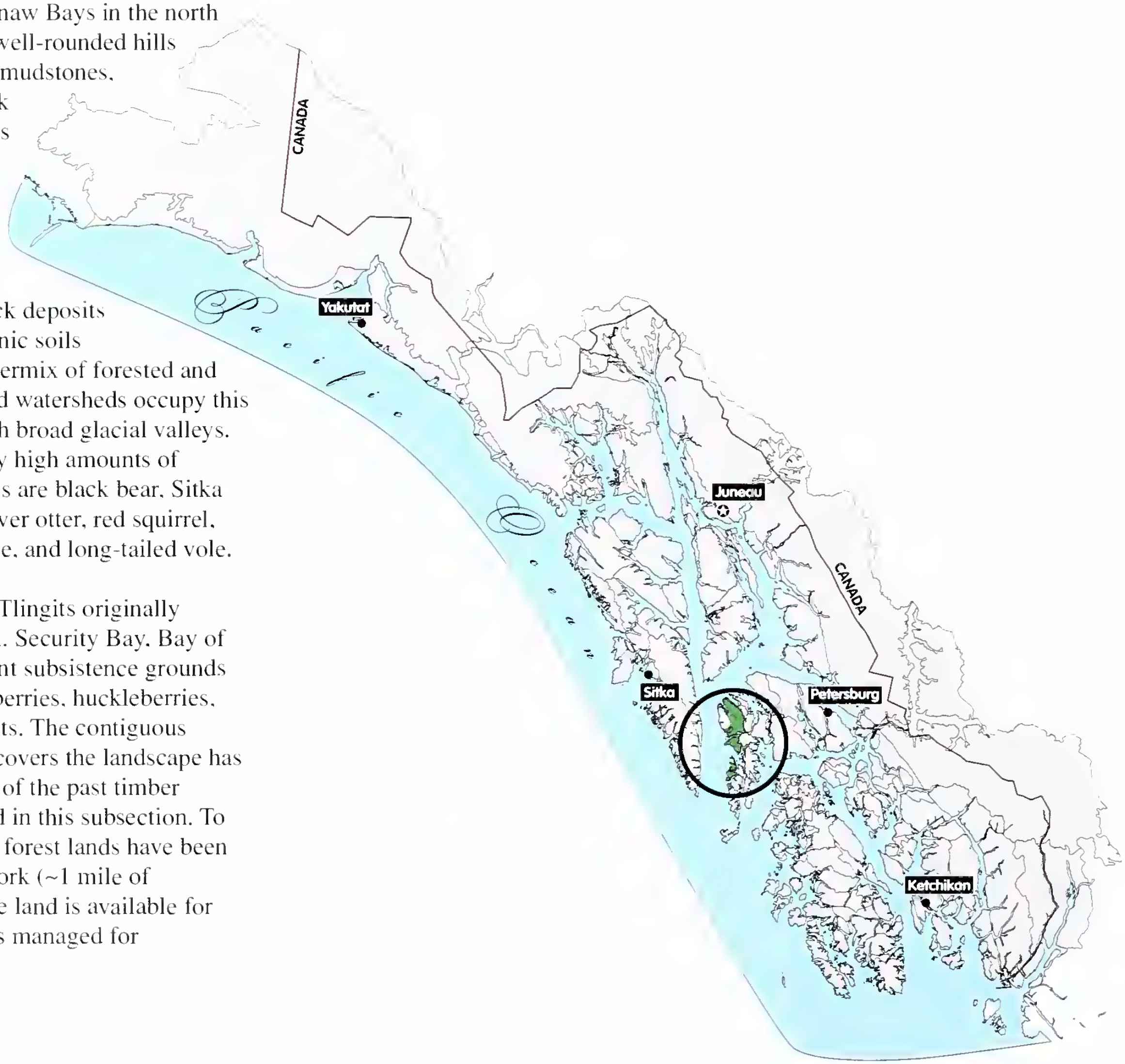
Alvin Bay Sediments	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (46%)	Lowlands (39%)	Hills (10%)	Valley Floor (5%)	Mountain Summits (1%)	97
Parent Materials	Colluvium (38%)	Ablation Till (26%)	Residuum (24%)	Glacial Drift (6%)	Compact Till (5%)	73
Soils	Spodosols (63%)	Histosols (35%)	Entisols (1%)	Inceptisols (1%)		97
Landcover	Hemlock (50%)	Hemlock-Spruce (22%)	Alder (9%)	Mixed Conifer (8%)	Lodgepole Pine (7%)	100
Productivity	Productive Forests (72%)	Nonproductive Forests (26%)	Nonforested (2%)			100
Site Index	SI 61-80 (36%)	SI 0-40 (30%)	SI 41-60 (20%)	SI >80 (14%)		100
Wetlands	Upland (58%)	Palustrine Forested (32%)	Palustrine Emergent (6%)	Palustrine Scrub-Shrub (1%)	Estuarine Intertidal (1%)	100
Stream Process Groups	High Gradient-Contained (60%)	Moderate Gradient-Mixed Control (16%)	Moderate Gradient-Contained (7%)	Floodplain (7%)	Palustrine (4%)	
Land Use Designations	Wilderness & Monument (53%)	Mostly Natural Setting (47%)				100



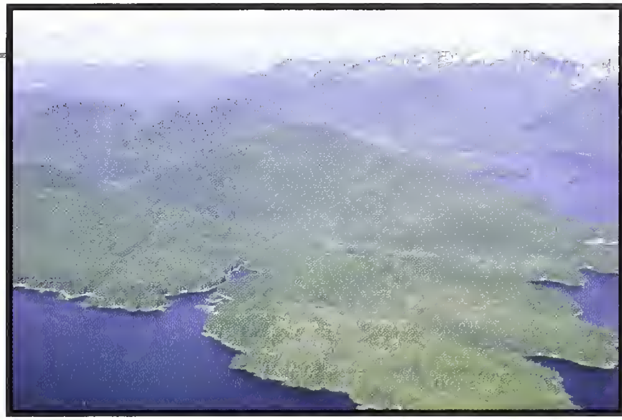


Rowan Sediments

Long, smooth forested hillslopes dissected by broad U-shaped glacial valleys characterize the northcentral portions of Kuiu Island. Running from Security and Saginaw Bays in the north to Port Malmesburg in the south, these well-rounded hills consist of sedimentary bedrock, chiefly mudstones, *graywackes*, and turbidites. This bedrock weathers to silty- or loamy-textured soils with an abundance of sharp rock fragments. These deep residual soils are well drained and support vast expanses of highly productive hemlock and hemlock-spruce forests. The broad undulating valleys are smeared with thick deposits of glacial *till*. Here, poorly drained organic soils predominate supporting an extensive intermix of forested and nonforested bogs and fens. Modest-sized watersheds occupy this area with main channels flowing through broad glacial valleys. These low-lying hills receive moderately high amounts of precipitation. Common forest inhabitants are black bear, Sitka black-tailed deer, wolf, marten, mink, river otter, red squirrel, common and dusky shrew, Keen's mouse, and long-tailed vole.

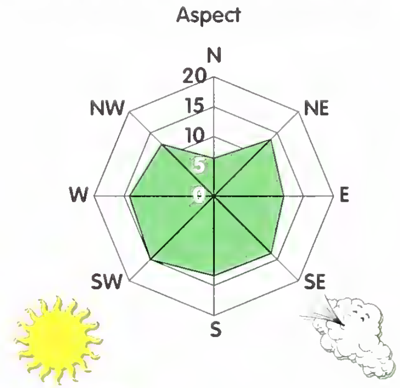


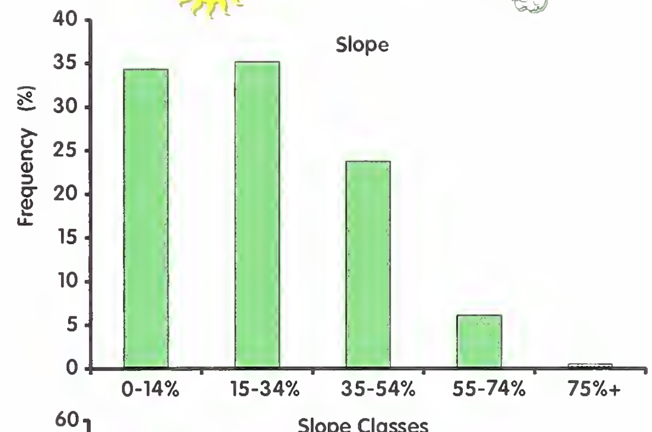
Land-Human Interactions. The Kake Tlingits originally inhabited the majority of this subsection. Security Bay, Bay of Pillars, and Tebenkof Bay were important subsistence grounds for deer, salmon, mink, river otter, blueberries, huckleberries, crabapples, black seaweed, and gumboots. The contiguous expanse of productive timberlands that covers the landscape has attracted timber interests. Indeed, much of the past timber harvest on Kuiu Island was concentrated in this subsection. To date, about 14 percent of the productive forest lands have been harvested from a fairly dense road network (~1 mile of road/square mile of land). About half the land is available for intensive development. The remainder is managed for wilderness and mostly natural settings.

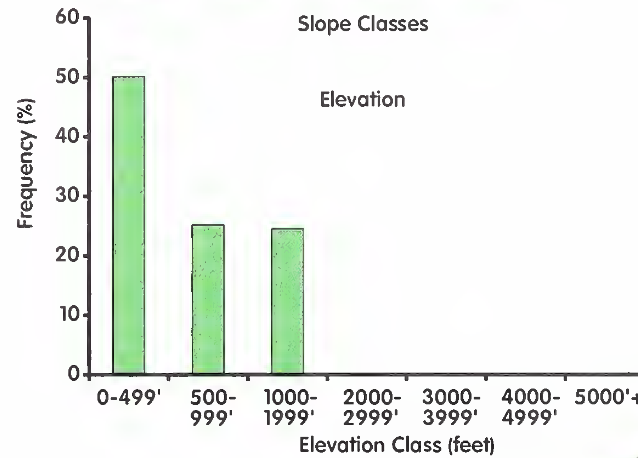


Kuiu Island as seen from Tebenkof Bay looking north from near Gap Point. The small bay left of center is Happy Cove. Elena Bay can be seen on the right side of the photo. Gentle topography covered by productive forests typifies this subsection.

Rowan Sediments	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (59%)	Lowlands (22%)	Valley Floor (12%)	Hills (5%)	Mountain Summits (1%)	99
Parent Materials	Residuum (42%)	Colluvium (40%)	Ablation Till (8%)	Glacial Drift (4%)	Compact Till (3%)	87
Soils	Spodosols (78%)	Histosols (20%)	Entisols (1%)	Inceptisols (1%)		99
Landcover	Hemlock-Spruce (38%)	Hemlock (37%)	Other (11%)	Mixed Conifer (5%)	Lodgepole Pine (4%)	100
Productivity	Productive Forests (86%)	Nonproductive Forests (11%)	Nonforested (2%)			100
Site Index	SI >80 (53%)	SI 61-80 (19%)	SI 0-40 (16%)	SI 41-60 (12%)		100
Wetlands	Upland (73%)	Palustrine Forested (20%)	Palustrine Emergent (4%)	Palustrine Scrub-Shrub (2%)	Estuarine Intertidal (1%)	100
Stream Process Groups	High Gradient-Contained (61%)	Moderate Gradient-Mixed Control (18%)	Floodplain (8%)	Palustrine (5%)	Moderate Gradient-Contained (3%)	
Land Use Designations	Intensive Development (45%)	Wilderness & Monument (27%)	Mostly Natural Setting (27%)	Private (1%)		100

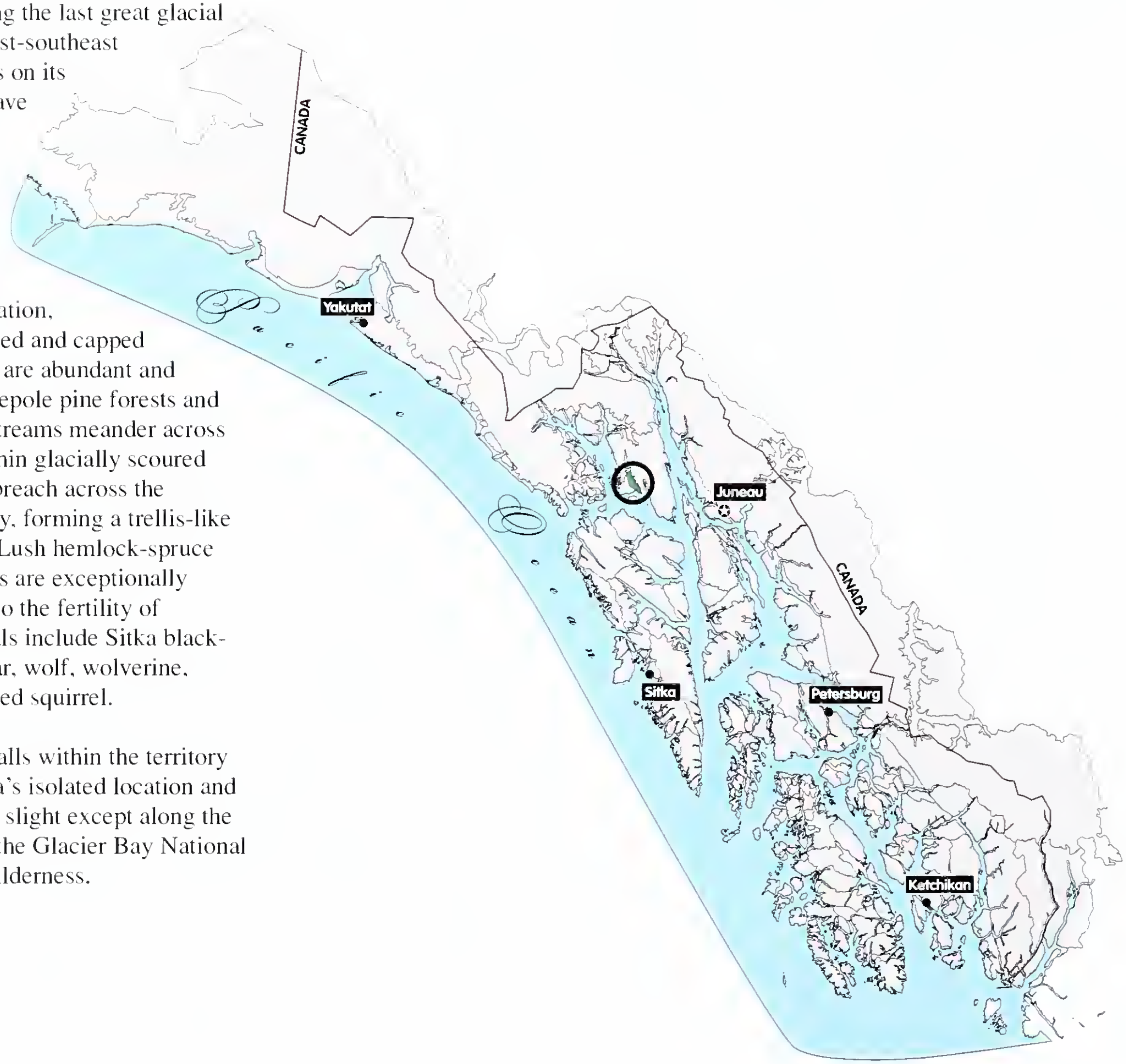






Salmon River Sediments

These calcareous argillite sedimentary foothills of the Chilkat Range gently slope southwest towards Glacier Bay. The area was heavily scoured by continental ice during the last great glacial period and retains conspicuous northwest-southeast trending, structurally controlled grooves on its surface. The soilscape and vegetation have developed since that time, unscathed by *neoglacial* ice readvances that have inundated neighboring areas. As such, this subsection is very distinctive compared to the younger surrounding landscapes. Although these foothills receive only moderate levels of precipitation, terraces within the area are poorly drained and capped with deep organics. Wetland complexes are abundant and include an intermixture of scrubby lodgepole pine forests and open *ericaceous* bogs and fens. Small streams meander across the wetlands and become contained within glacially scoured valleys. Streams merge and eventually breach across the northwest-southeast trending topography, forming a trellis-like network as they descend onto the flats. Lush hemlock-spruce forests occupy steeper places. All forests are exceptionally brushy in the understory, probably due to the fertility of calcareous soils. Common land mammals include Sitka black-tailed deer, moose, brown and black bear, wolf, wolverine, marten, porcupine, Keen's mouse, and red squirrel.



Land-Human Interactions. The area falls within the territory of the Hoonah tribe. Because of the area's isolated location and wetland cover, Native use was probably slight except along the shoreline. This subsection is located in the Glacier Bay National Park and Preserve and is managed as wilderness.

A flowing mix of forested and nonforested wetlands spread across the Salmon River Sediments at the base of Excursion Ridge. A trellis-like drainage pattern has resulted from waters collecting within and breaching across glacial scours oriented in a northwest-southeast direction.

Complex Sedimentary and Volcanics

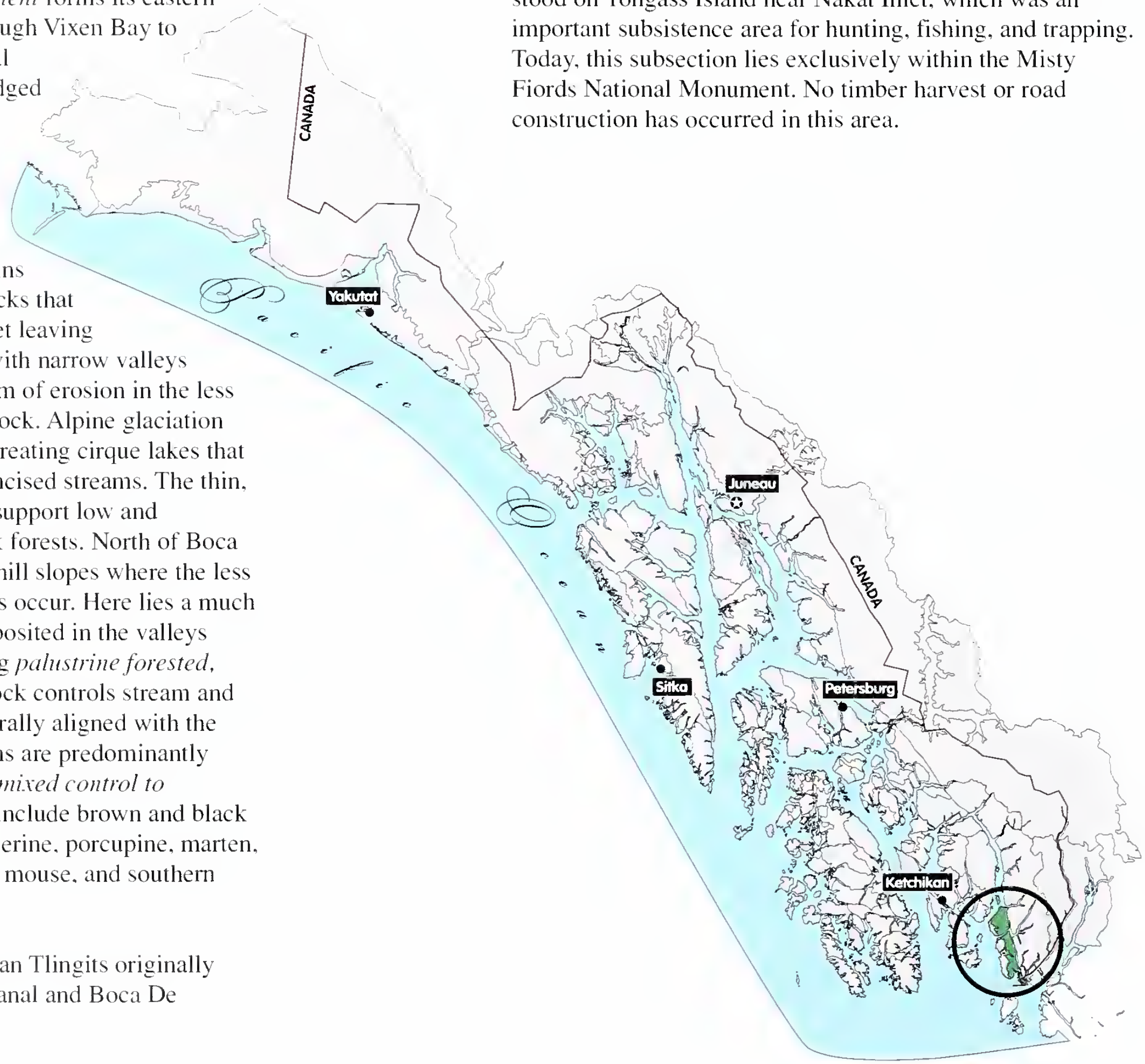
These "complex" areas have a wide variety of *lithologies* composed principally of *undivided* sedimentary and volcanic rocks. Common rock types include volcanic rocks of basaltic and andesitic composition, as well as flow rocks, *breccia* and *tuffs*, *graywacke* (a muddy sandstone), mudstone, carbonate rocks (limestone), conglomerate, and the regionally *metamorphosed* equivalents of these strata. These rocks may be relatively undeformed to highly *deformed*. Glacial flow and drainage patterns tend to follow geologic structure and bedding, if present. Soils mimic the original texture of the bedrock or parent material. A mixture of forest types and plant communities exists across the area as a function of drainage, aspect, and elevation.


CANADA
Yakutat
Pacific Ocean
Juneau
CANADA
Sitka
Petersburg
Ketchikan

Boca De Quadra Complex

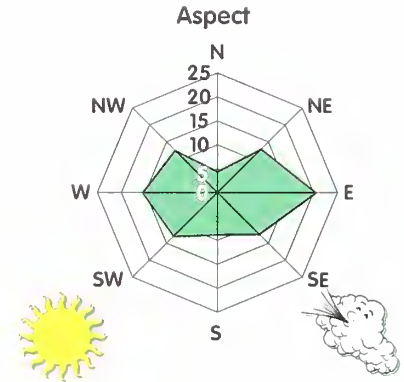
This subsection is a northwest-southeast trending band of sedimentary, volcanic, and granitic rocks located on the south mainland. The Coast Range *megalineament* forms its eastern boundary from Smeaton Bay south through Vixen Bay to Nakat Bay. It appears to be a transitional landscape—a moderate relief range wedged between the rugged Misty Fiords Granitics to the east and the flat Foggy Bay Till Lowlands to the west. Peninsula Ridge encompasses a good share of this subsection. This ridge is comprised of rounded hills and mountains of mostly granodiorite and tonalite—rocks that resisted the massive continental ice sheet leaving rounded knobs. The ridge is dissected with narrow valleys where down cutting is the dominant form of erosion in the less resistant faults and fractures of the bedrock. Alpine glaciation also played a part in this landscape by creating cirque lakes that are presently drained by swift, deeply incised streams. The thin, relatively nutrient-poor mountain soils support low and moderately productive western hemlock forests. North of Boca De Quadra, wider valleys surround the hill slopes where the less resistant sedimentary and volcanic rocks occur. Here lies a much more scoured landscape. Glacial *till* deposited in the valleys underlies a variety of wetlands including *palustrine forested, scrub-shrub, and emergent types*. Bedrock controls stream and *fjord* networks. Valley systems are generally aligned with the direction of past ice movements. Streams are predominantly lower gradient, ranging from *moderate mixed control to palustrine*. Common forest inhabitants include brown and black bear, Sitka black-tailed deer, wolf, wolverine, porcupine, marten, red and northern flying squirrel, Keen's mouse, and southern red-backed vole.

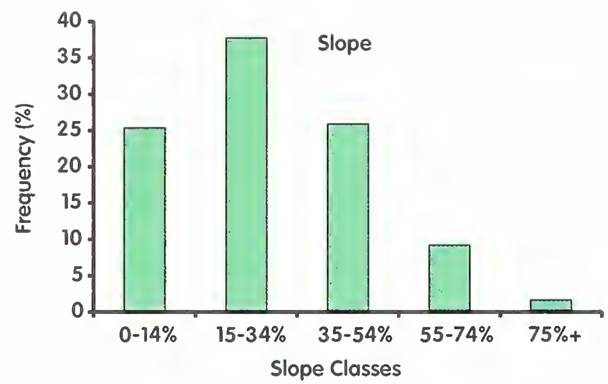
Land-Human Interactions. The Saxman Tlingits originally inhabited the lands adjacent to Behm Canal and Boca De Quadra. The migratory Tongass Tlingits traversed the southern portion of this subsection. Their main village once stood on Tongass Island near Nakat Inlet, which was an important subsistence area for hunting, fishing, and trapping. Today, this subsection lies exclusively within the Misty Fiords National Monument. No timber harvest or road construction has occurred in this area.

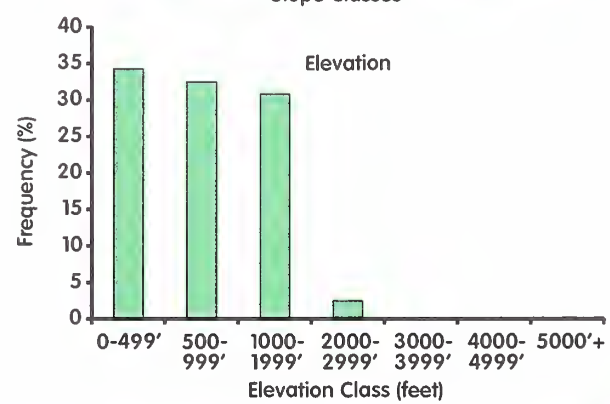


A heavy-forested, undulating landscape occurs west of Weasel Cove near Boca De Quadra on the southern mainland. This view looks northwest, with Behm Canal appearing in the background. The northwest-southeast trending band of complex geology of intermediate relief typifies this subsection. Wide valleys, oriented in the direction of past ice flows, often have glacial till deposits underlying extensive wetland areas. The mountains of Revillagigedo Island are seen in the distance.

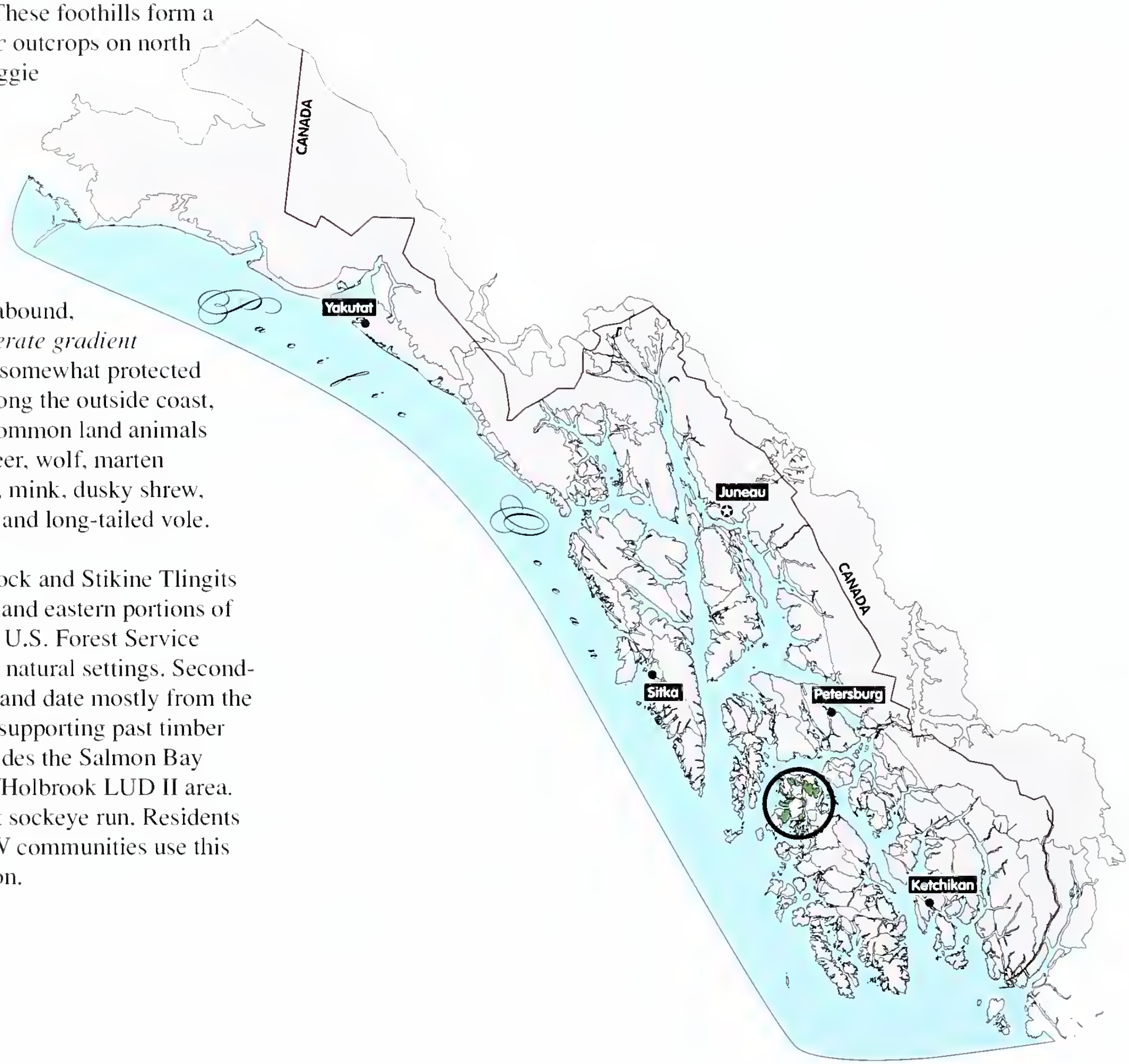
Boca De Quadra Complex	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms						0
Parent Materials						0
Soils						0
Landcover	Hemlock (37%)	Mixed Conifer (28%)	Lodgepole Pine (21%)	Hemlock-Spruce (7%)	Other (3%)	100
Productivity	Nonproductive Forests (53%)	Productive Forests (45%)	Nonforested (2%)			100
Site Index	SI 0-40 (95%)	SI >80 (5%)				100
Wetlands	Upland (50%)	Palustrine Forested (32%)	Palustrine Scrub-Shrub (9%)	Palustrine Emergent (8%)		100
Stream Process Groups	High Gradient-Contained (53%)	Moderate Gradient-Mixed Control (15%)	Moderate Gradient-Contained (13%)	Palustrine (6%)	Low Gradient-Contained (5%)	
Land Use Designations	Wilderness & Monument (100%)					100







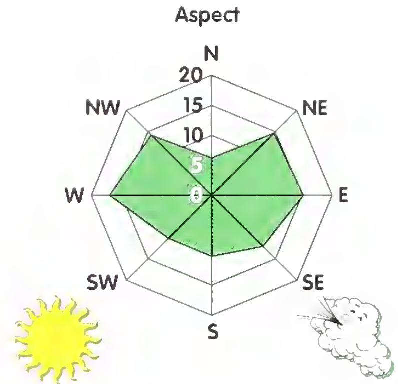
This is a set of lobate ridges and hills dissected by deep U-shaped valleys. The rolling *terrain* is underlain by non-carbonate conglomerate and granodioritic rocks. These foothills form a discontinuous apron around the *plutonic* outcrops on north Prince of Wales Island, and include Maggie Mountain, Shakan Peninsula, and areas surrounding Salmon Bay Lake. Productive forests of hemlock and hemlock-spruce cover about two-thirds of the area. The remainder is principally low productive wetland forests of mixed conifers and lodgepole pine. *High gradient contained streams* abound, except within broad valleys where *moderate gradient streams* dominate. Although the area is somewhat protected from the extreme weather conditions along the outside coast, precipitation is still moderately high. Common land animals include black bear, Sitka black-tailed deer, wolf, marten (introduced), ermine, river otter, beaver, mink, dusky shrew, northern flying squirrel, Keen's mouse, and long-tailed vole.

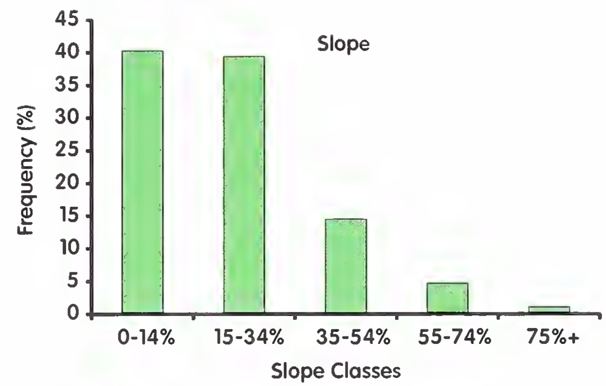


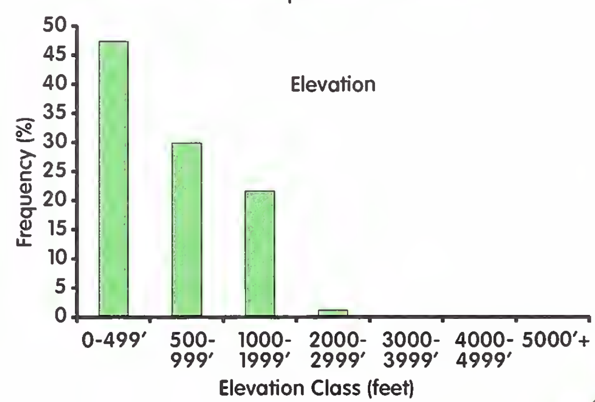
Land-Human Interactions. The Klawock and Stikine Tlingits hunted, fished, and trapped the western and eastern portions of this subsection, respectively. Today, the U.S. Forest Service manages over 60 percent of the area for natural settings. Second-growth forests in the area are extensive and date mostly from the 1980s. A fairly dense network of roads supporting past timber harvest is present. This subsection includes the Salmon Bay LUD II area and portions of the Calder/Holbrook LUD II area. Salmon Bay Lake supports a significant sockeye run. Residents of Petersburg, Wrangell, and north POW communities use this run to obtain subsistence sockeye salmon.

The North Prince of Wales Complex is characterized by wide U-shaped valleys and rolling hills. This rather small and discontinuous subsection is located on the north end of Prince of Wales Island. Salmon Bay Lake (center) is a prominent feature in this landscape. Timber harvest is common in this productive area due to the moderate topography and well-drained soils.

North POW Complex	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Hills (80%)	Valley Floor (16%)	Mountain Summits (3%)	Mountain Slopes (1%)		45
Parent Materials	Organic Material (96%)	Bedrock (3%)	Alluvial (1%)			44
Soils	Histosols (95%)	Miscellaneous (4%)	Entisols (1%)			45
Landcover	Hemlock (37%)	Hemlock-Spruce (17%)	Lodgepole Pine (14%)	Mixed Conifer (14%)	Other (11%)	100
Productivity	Productive Forests (63%)	Nonproductive Forests (32%)	Nonforested (5%)			100
Site Index	SI 41-60 (55%)	SI >80 (20%)	SI 0-40 (18%)	SI 61-80 (7%)		74
Wetlands	Upland (51%)	Palustrine Forested (34%)	Palustrine Emergent (12%)	Lacustrine Limnetic (1%)	Estuarine Intertidal (1%)	100
Stream Process Groups	High Gradient-Contained (77%)	Moderate Gradient-Contained (9%)	Moderate Gradient-Mixed Control (5%)	Floodplain (4%)	Lake (3%)	
Land Use Designations	Mostly Natural Setting (61%)	Intensive Development (26%)	Moderate Development (12%)	Private (1%)		100

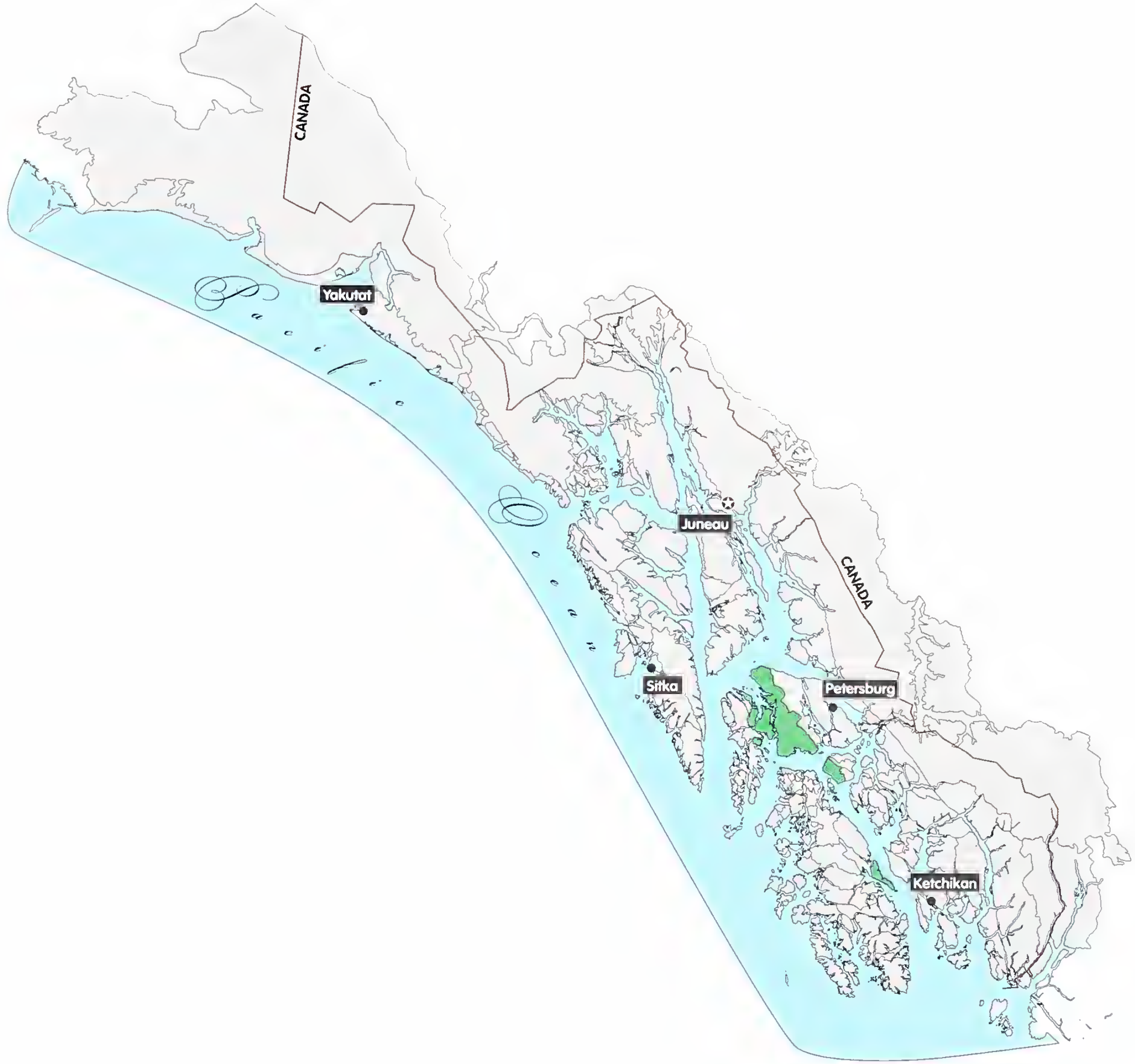






Volcanics

Volcanic rocks of basaltic and andesitic composition dominate these areas. These include flow rocks, *breccia, tuffs*, and rhyolites with interbeds of mudstone, conglomerate, minor carbonates, and regionally *metamorphosed* and *deformed* equivalents of these strata (greenschist, greenstone, phyllite, schist, and gneiss). These rocks predate the last major glacial advance and consequently have been overridden and shaped by the forces of ice. Glacial deposits are scattered throughout resulting in a mixture of glacial and volcanic soils. General landscape conditions (particularly vegetation patterns) tend to reflect the flow patterns of volcanic rocks. Drainage is controlled by geologic structure and bedding where present. Cliffs tend to form along geologic breaks. Landslides often initiate at the soil-bedrock contact on steep slopes. Fine-grained soils derived from volcanic bedrocks are somewhat impermeable and often wet. As a result, vast areas of poorly drained wetland complexes and peatlands often occupy these landscapes. Volcanics tend to weather into angular fragments or flat rocks called "flags." Streambeds comprised of these substrates are poor habitat for spawning fish and aquatic invertebrates.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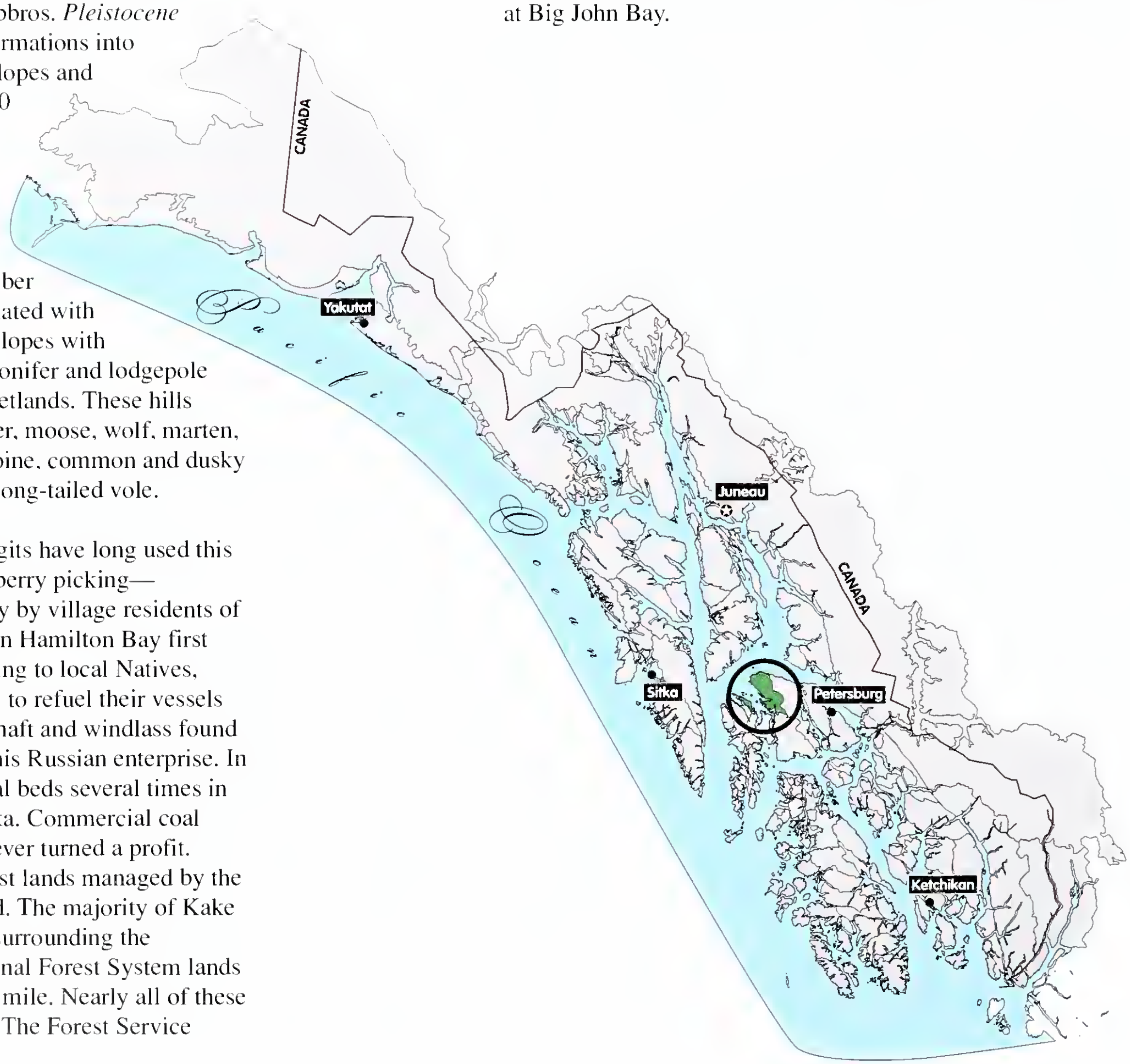
Kake Volcanics

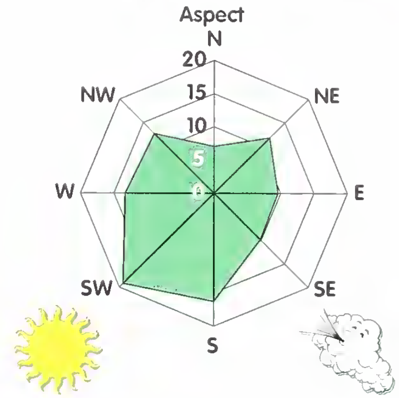
Hills of undivided sedimentary and volcanic rocks comprise the northwest corner of Kupreanof Island. Also present are pockets of rhyolites, basalts, carbonates, and gabbros. *Pleistocene* glaciation rounded and reduced these formations into rolling topography with mostly gentle slopes and elevations that are generally below 1,000 feet. Rainfall is moderate, probably a function of its low relief and the rain shadow created by the high mountains of Baranof Island to the west. Most streams are *moderate to low gradient* with *mixed containment*. Productive timber stands of hemlock and spruce are associated with raised relief. In the lowlands on gentle slopes with organic soils, stunted forests of mixed conifer and lodgepole pine are found as well as nonforested wetlands. These hills harbor black bear, Sitka black-tailed deer, moose, wolf, marten, beaver, ermine, mink, river otter, porcupine, common and dusky shrew, red squirrel, Keen's mouse, and long-tailed vole.

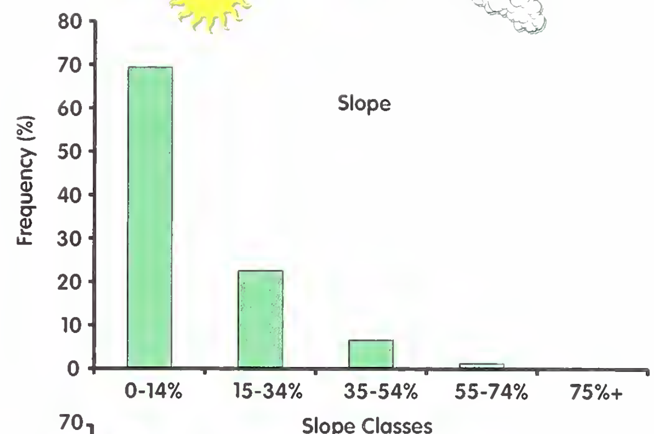
Land-Human Interactions. Kake Tlingits have long used this area for hunting, fishing, trapping, and berry picking—subsistence activities that continue today by village residents of Kake. Small bituminous coal deposits in Hamilton Bay first attracted Europeans to the area. According to local Natives, Russians entered Hamilton Bay for coal to refuel their vessels (Roppel 1991). The remains of an old shaft and windlass found in 1901 corroborated oral accounts of this Russian enterprise. In 1868, the U.S. Navy exploited these coal beds several times in their travels throughout Southeast Alaska. Commercial coal mining has been attempted since, but never turned a profit. About 15 percent of the productive forest lands managed by the U.S. Forest Service have been harvested. The majority of Kake Tribal and Sealaska Corporation lands surrounding the community of Kake has been cut. National Forest System lands have about 0.6 miles of road per square mile. Nearly all of these roads connect to the Kake road system. The Forest Service currently manages public lands for resource development or natural settings. A national forest recreation cabin is located at Big John Bay.

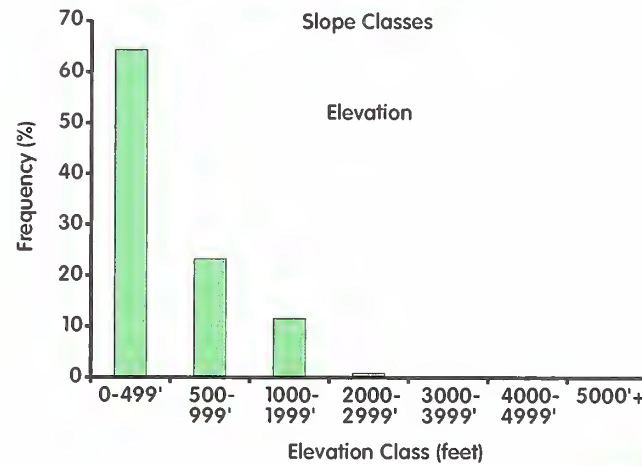


A scene looking northeast from over Eva Island in Keku Strait. Hamilton Island is in the foreground and the low rolling topography of Kupreanof Island is seen in the background. The village of Kake (not visible) lies to the left of Hamilton Island.

Kake Volcanics	Ranked Order					% GRID reporting data
	1st	2nd	3rd	4th	5th	
Landforms	Lowlands (42%)	Mountain Slopes (26%)	Hills (15%)	Valley Floor (15%)	Coastal (2%)	99
Parent Materials	Colluvium (43%)	Residuum (17%)	Glaciomarine (11%)	Ablation Till (10%)	Compact Till (8%)	66
Soils	Spodosols (55%)	Histosols (43%)	Entisols (2%)			99
Landcover	Brush (23%)	Hemlock (19%)	Lodgepole Pine (15%)	Mixed Conifer (15%)	Other (14%)	100
Productivity	Productive Forests (37%)	Nonproductive Forests (34%)	Nonforested (28%)			89
Site Index	SI 0-40 (36%)	SI 61-80 (27%)	SI >80 (22%)	SI 41-60 (15%)		100
Wetlands	Palustrine Forested (44%)	Upland (42%)	Palustrine Emergent (8%)	Palustrine Scrub-Shrub (3%)	Estuarine Intertidal (1%)	100
Stream Process Groups	Moderate Gradient-Mixed Control (29%)	High Gradient-Contained (24%)	Floodplain (18%)	Palustrine (10%)	Moderate Gradient-Contained (8%)	
Land Use Designations	Private (39%)	Intensive Development (33%)	Mostly Natural Setting (23%)	Moderate Development (5%)		100



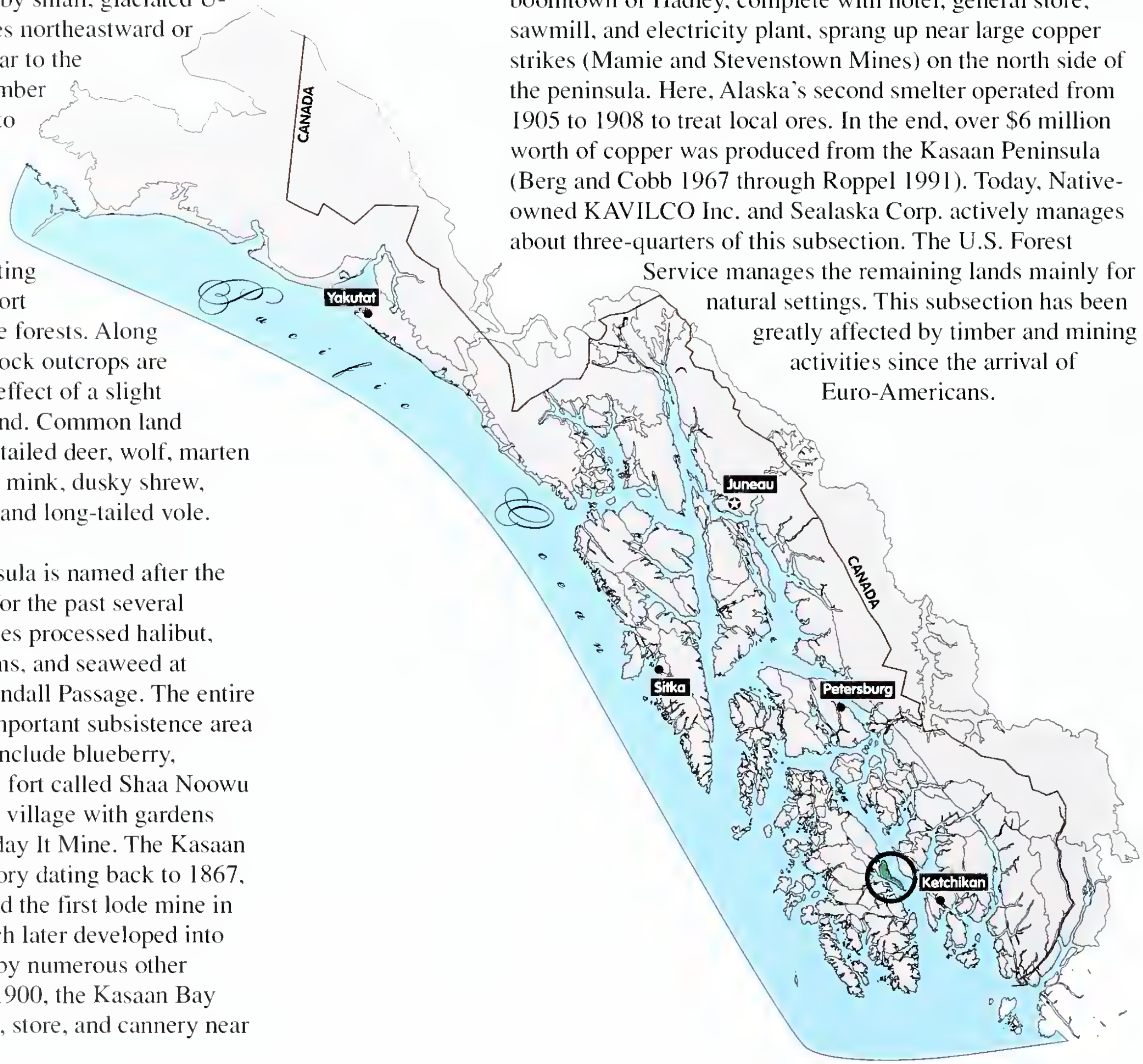


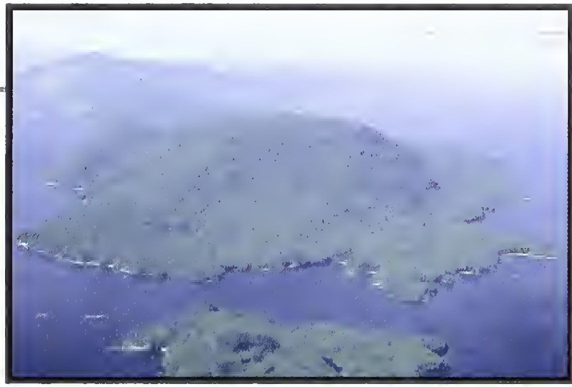


Kasaan Peninsula Volcanics

This southeast-northwest trending peninsula juts into Clarence Strait from the east side of Prince of Wales Island. Its spine consists of rounded volcanics dissected by small, glaciated U-shaped valleys. The area generally slopes northeastward or southwestward—directions perpendicular to the main axis of the peninsula. Extensive timber harvest has converted much of the area to second-growth forest (categorized as brush in the accompanying table). Broad ridgetops covered with organic soils support shrub and forested wetlands. Well-drained soils predominating on mountain toeslopes and valleys support productive hemlock and hemlock-spruce forests. Along the coastline, soils are shallow and bedrock outcrops are common. Moderate precipitation is the effect of a slight rainshadow cast by Prince of Wales Island. Common land animals include black bear, Sitka black-tailed deer, wolf, marten (introduced), ermine, river otter, beaver, mink, dusky shrew, northern flying squirrel, Keen's mouse, and long-tailed vole.

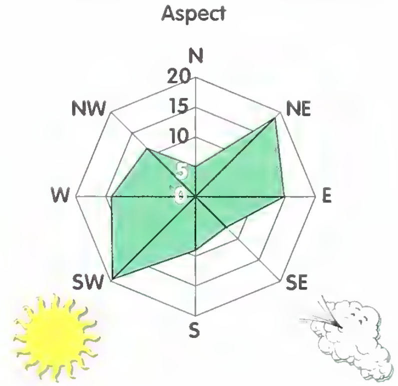
Land-Human Interactions. The peninsula is named after the Kasaan Haida who resided in this area for the past several centuries. Native camps and smokehouses processed halibut, salmon, black cod, deer, gumboots, clams, and seaweed at Tolstoi Bay, Lyman Anchorage, and Grindall Passage. The entire south shore was, and still remains, an important subsistence area for the Kasaan people. Plant resources include blueberry, salmonberry, and salal berries. A Native fort called Shaa Noowu formerly stood at Mt. Andrew. A Native village with gardens occurred at Mills Bay near the present-day It Mine. The Kasaan Peninsula has a rich copper mining history dating back to 1867, when Charles Vincent Baranovich staked the first lode mine in Alaska (Roppel 1991). This claim, which later developed into the Copper Queen Mine, was followed by numerous other prospects throughout the peninsula. In 1900, the Kasaan Bay Mining Company established a sawmill, store, and cannery near the Copper Queen Mine. This community was named Kasaan after local natives relocated their village there. The boomtown of Hadley, complete with hotel, general store, sawmill, and electricity plant, sprang up near large copper strikes (Mamie and Stevenstown Mines) on the north side of the peninsula. Here, Alaska's second smelter operated from 1905 to 1908 to treat local ores. In the end, over $6 million worth of copper was produced from the Kasaan Peninsula (Berg and Cobb 1967 through Roppel 1991). Today, Native-owned KAVILCO Inc. and Sealaska Corp. actively manages about three-quarters of this subsection. The U.S. Forest Service manages the remaining lands mainly for natural settings. This subsection has been greatly affected by timber and mining activities since the arrival of Euro-Americans.

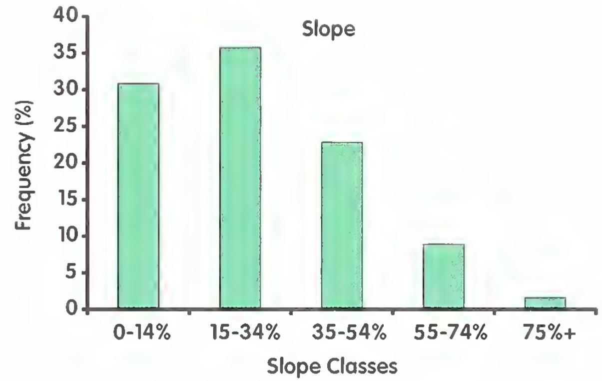


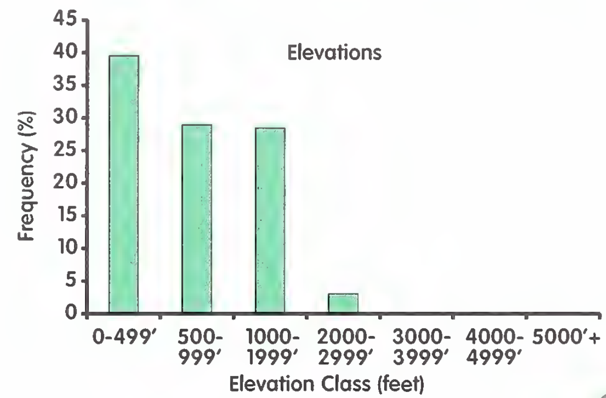


The Kasaan Peninsula is the longest peninsula along the eastern shoreline of central Prince of Wales Island. Surrounded by Clarence Strait (right) and Kasaan Bay (left), this rounded volcanic landscape slopes mainly northeastward or southwestward. Because of the well-drained nature of the soils here, highly productive, old-growth forests once graced these slopes. Today much of the area has been converted to second-growth forests. Grindall Island, in the foreground, is also part of this subsection.

Kasaan Peninsula Volcanics	1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (67%)	Hills (18%)	Valley Floor (15%)	Lowlands (1%)		52
Parent Materials	Organic Material (53%)	Compact Till (47%)				49
Soils	Histosols (56%)	Spodosols (44%)				52
Landcover	Brush (60%)	Hemlock (13%)	Mixed Conifer (12%)	Hemlock-Spruce (5%)	Lodgepole Pine (3%)	100
Productivity	Nonforested (63%)	Productive Forests (20%)	Nonproductive Forests (17%)			100
Site Index	SI 61-80 (36%)	SI 0-40 (24%)	SI >80 (20%)	SI 41-60 (20%)		75
Wetlands	Upland (63%)	Palustrine Forested (26%)	Palustrine Scrub-Shrub (5%)	Palustrine Emergent (4%)		100
Stream Process Groups	High Gradient-Contained (73%)	Moderate Gradient-Contained (12%)	Moderate Gradient-Mixed Control (7%)	Floodplain (3%)	Lake (2%)	
Land Use Designations	Private (71%)	Mostly Natural Setting (21%)	Moderate Development (7%)			100

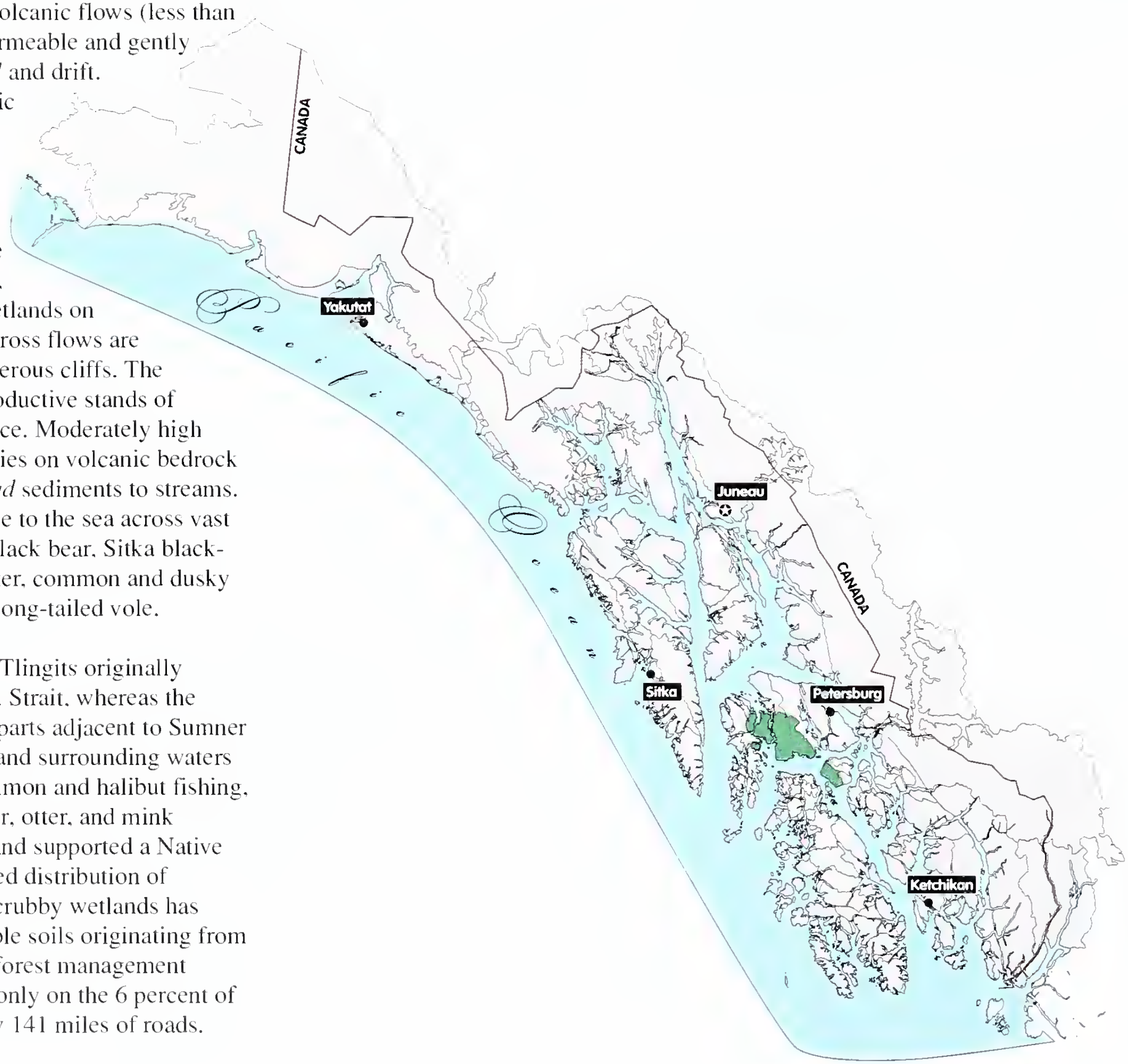




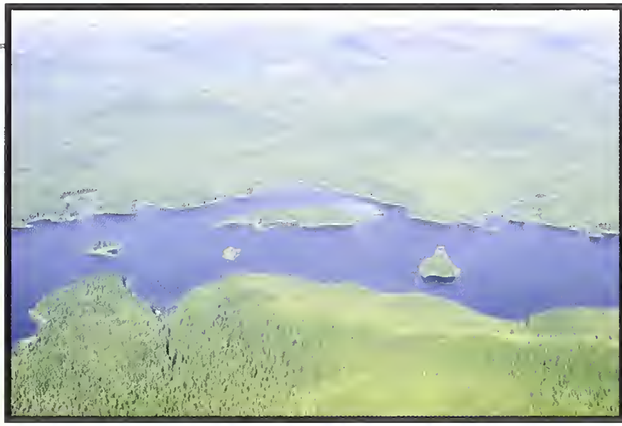


Sumner Strait Volcanics

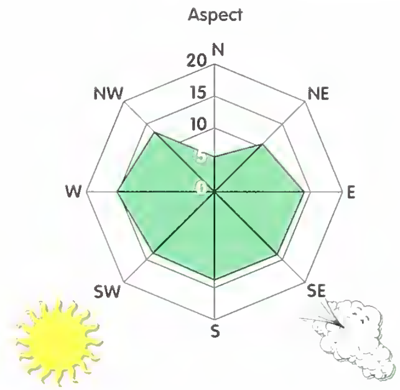
A rolling volcanic landscape of benched hills and lava plateaus extends from east Kuiu Island across southwest Kupreanof Island to west Zarembo Island. Young volcanic flows (less than a million years old) are somewhat impermeable and gently rise from a lowland matrix of glacial *till* and drift. Glaciation has erased prominent volcanic features leaving behind an eroded landscape of alternating strata of volcanic flows. Slopes that follow the direction of flow are long and gentle and support a mixture of low productive forested (hemlock, Alaska yellow cedar, and lodgepole pine) and nonforested wetlands on shallow organic soils. Slopes that cut across flows are short, steep, and stair-stepped with numerous cliffs. The mineral soils of these slopes support productive stands of hemlock, Alaska yellow cedar, and spruce. Moderately high precipitation feeds actively eroding gullies on volcanic bedrock that contribute a large amount of *bedload* sediments to streams. *Low to moderate gradient streams* amble to the sea across vast lowlands. Common mammals include black bear, Sitka black-tailed deer, wolf, marten, mink, river otter, common and dusky shrew, red squirrel, Keen's mouse, and long-tailed vole.

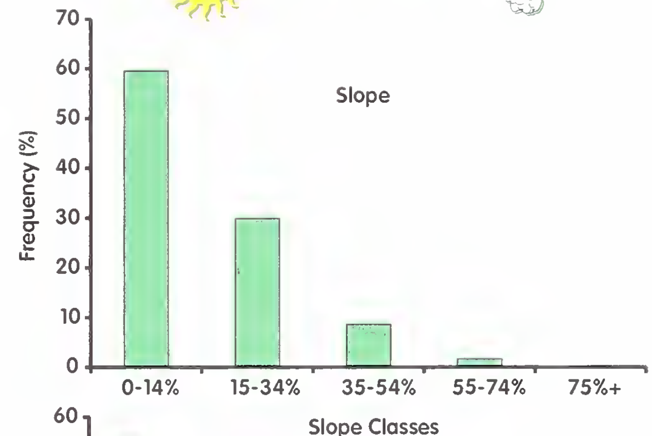


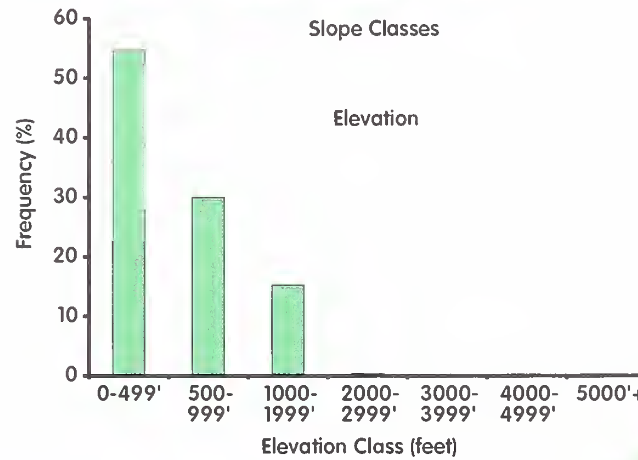
Land-Human Interactions. The Kake Tlingits originally inhabited the northern areas along Keku Strait, whereas the Stikine Tlingits resided in the southern parts adjacent to Sumner Strait. These rolling hills and lowlands and surrounding waters were used for deer and bear hunting, salmon and halibut fishing, berry and seaweed gathering, and beaver, otter, and mink trapping. The west side of Zarembo Island supported a Native village, fort, and fish camp. The scattered distribution of productive forest among vast areas of scrubby wetlands has deterred past timber harvest. The unstable soils originating from *pyroclastic* materials further precludes forest management activities. Timber harvest has occurred only on the 6 percent of the productive forest lands supported by 141 miles of roads.



An eastward view from Kuiu Island across Rocky Pass to Kupreanof Island. This scene captures the undulating, low-relief volcanic flows that characterize this subsection. Beacon Island lies at the left center of the photo.







Sumner Strait Volcanics	Ranked Order					% GRID reporting data
	1st	2nd	3rd	4th	5th	
Landforms	Lowlands (57%)	Mountain Slopes (30%)	Hills (5%)	Valley Floor (4%)	Mountain Summits (2%)	99
Parent Materials	Residuum (29%)	Colluvium (27%)	Ablation Till (19%)	Compact Till (8%)	Glacial Drift (8%)	49
Soils	Histosols (61%)	Spodosols (37%)	Entisols (2%)			99
Landcover	Hemlock (28%)	Alder (18%)	Hemlock-Spruce (18%)	Lodgepole Pine (14%)	Mixed Conifer (12%)	100
Productivity	Productive Forests (48%)	Nonproductive Forests (48%)	Nonforested (4%)			100
Site Index	SI 0-40 (52%)	SI 41-60 (20%)	SI 61-80 (18%)	SI >80 (10%)		100
Wetlands	Palustrine Forested (37%)	Upland (36%)	Palustrine Emergent (20%)	Palustrine Scrub-Shrub (6%)	Estuarine Intertidal (1%)	100
Stream Process Groups	High Gradient-Contained (41%)	Moderate Gradient-Mixed Control (19%)	Floodplain (13%)	Moderate Gradient-Contained (11%)	Palustrine (7%)	
Land Use Designations	Mostly Natural Setting (52%)	Intensive Development (44%)	Moderate Development (4%)			100

Massive continental ice sheets completely overrode these low-lying areas, creating a flat to undulating *terrain*. Most lowlands occur in the central and southern portions of the Alexander Archipelago. Glacial erosion and deposition are highly complex and result in equally diverse landscape patterns (Matthews 1992). Various glacial deposits (*till* and outwash) underlie much of the area, except in places where the bedrock was intensely scoured. The ocean also covered portions of these lowlands until the earth's crust rebounded following the retreat of the continental glaciers (*isostatic rebound*). The low permeability of the original compact *till* and subsequent *glaciomarine* deposits has caused these surfaces to develop into vast wetland complexes. Due to the abundance of year-round precipitation and seasonal meltwater runoff, water invariably accumulates on flat to gently sloping areas causing widespread soil saturation (Zach 1950). Organic soils form in these *anaerobic* wet conditions and support *hydrophilic* (water-loving) plants. The National Wetland Inventory data indicate that between 33 and 82 percent of these lowland surfaces are wetlands.

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These are low-lying areas underlined by sediments deposited directly from glacier ice (*tills*). Glaciers move debris along their base (subglacial), within their icy mass (englacial), and on their surface (superglacial) (Matthews 1992). Subglacial debris tends to be highly modified by grinding and crushing, whereas englacial and superglacial debris tends to retain it original structure (e.g., coaser angular clasts) due to passive transport. Deposition of *till* occurs primarily by lodgement and melt-out (Matthews 1992). Lodgement *till* is plastered on subglacial surfaces as the result of the drag of glacial-transported debris against the bed. It occurs where flowing ice is not eroding the underlining surface, and often exists in discontinuous pockets or in sheets of variable thickness and extent. Moraine and *drumlin* fields are characteristic of lodgement *till* deposits. *Ablation* or melt-out *tills* are deposited when ice releases accrued sediments as it melts. These *tills* often overlie lodgement *tills* and may possess crude stratification through the thawing process. In all, *till*-deposited landscapes vary widely in character (texture and depth) because of these and other differences (e.g., the amount and proportion of subglacial, englacial, and superglacial debris; type of deposition; *lithologic* origin; rapidity of ice retreat; possible ice readvancement and sediment redistribution). Due to discontinuous deposition of sediments and glacial and post-glacial erosion, patches of scoured bedrock are an inherently part of these landscapes, forming bedrock-drift complexes.


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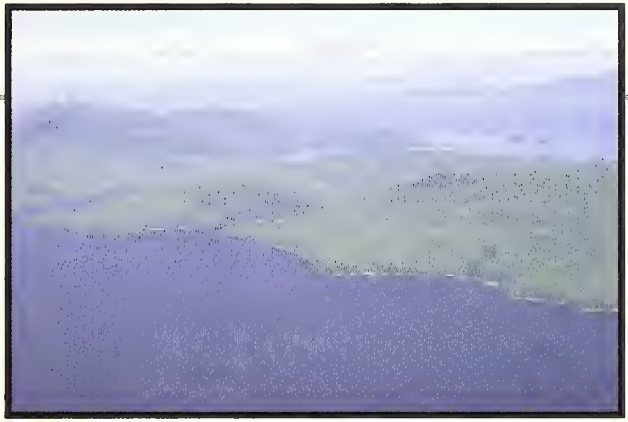
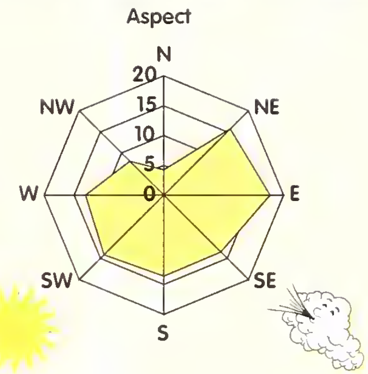
Affleck Canal Till Lowlands

The glacially striated peninsular lobes of southern Kuiu Island distinctly mark the direction of ice movement across this area. These low-lying *terrains* encompass broad undulating lowlands and gently rolling hills. Some moderate to steep hillslopes occur adjacent to beachfronts. Sedimentary rocks, principally *graywacke*, lie close to the surface in many places due to heavy glacial scour. Much of the area is smeared with a thin veneer of glacial drift and *till*. Poorly-drained mineral and organic soils abound, supporting an intricate array of forested wetlands of mixed conifer and lodgepole pine and shrubby bogs and fens. Moderately high levels of precipitation supply water to this vast wetland complex that altogether covers 70 percent of the area. More productive stands of hemlock occur on steeper, better-drained hillslopes where incised streams flow. *Moderate gradient streams* flow through the lowlands. These lowlands harbor black bear, Sitka black-tailed deer, wolf, marten, mink, river otter, common and dusky shrew, red squirrel, Keen's mouse, and long-tailed vole.

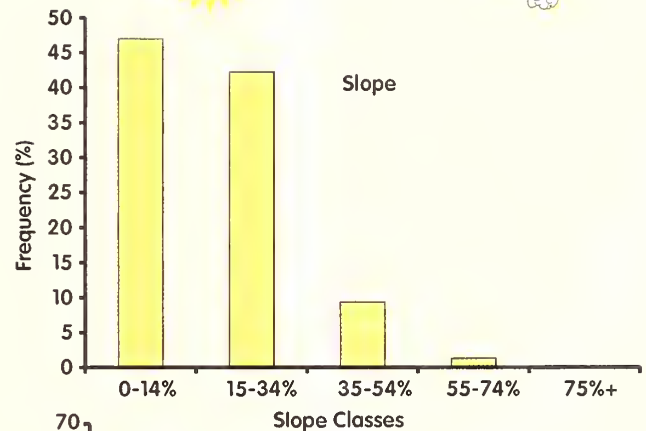
Land-Human Interactions. Kake and Klawock Tlingits inhabited this area prior to European arrival. Since Native relocation in the early 1900s, human activity has been limited in this remote subsection. Timber harvests and roading are virtually nonexistent here. The area is largely protected through mostly natural setting and wilderness designations.

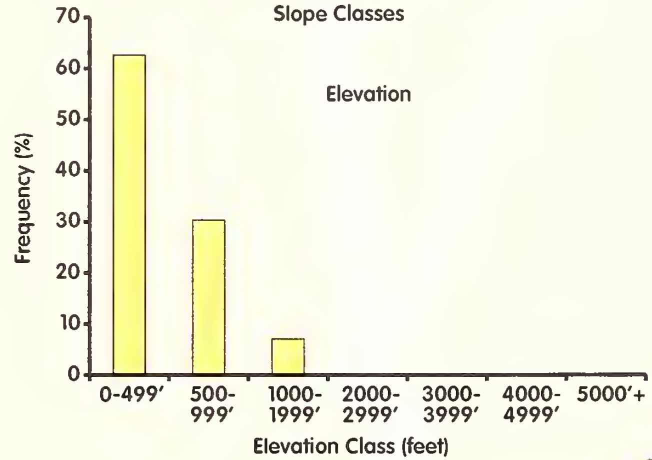


A view from Affleck Canal looking to the northeast over Affleck Peninsula near the south end of Kuiu Island. Louise Cove is seen on the far side of the peninsula near the center of the photo. Beauclerc Peak is located near the upper left corner. The low gentle relief attests to past glaciation. Forested and nonforested wetlands are abundant on this glacially scoured landscape.



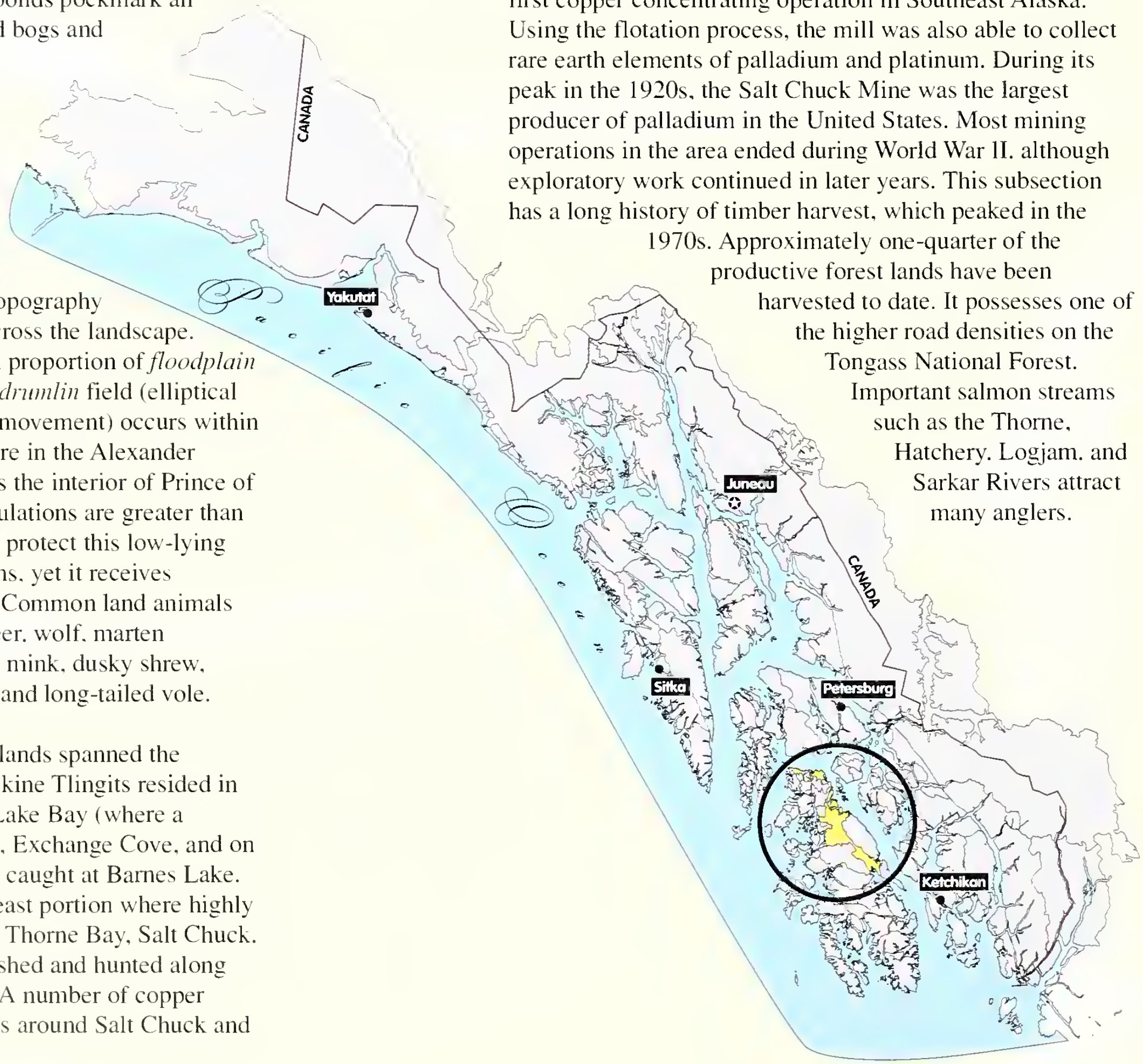
Affleck Canal Till Lowlands	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Lowlands (68%)	Mountain Slopes (22%)	Hills (8%)	Valley Floor (1%)		98
Parent Materials	Ablation Till (34%)	Residuum (17%)	Compact Till (16%)	Colluvium (16%)	Glacial Drift (15%)	45
Soils	Histosols (68%)	Spodosols (32%)				98
Landcover	Hemlock (36%)	Alder (26%)	Mixed Conifer (15%)	Hemlock-Spruce (13%)	Lodgepole Pine (8%)	100
Productivity	Productive Forests (49%)	Nonproductive Forests (49%)	Nonforested (2%)			100
Site Index	SI 0-40 (55%)	SI 41-60 (21%)	SI 61-80 (19%)	SI >80 (6%)		100
Wetlands	Palustrine Forested (47%)	Upland (30%)	Palustrine Emergent (18%)	Palustrine Scrub-Shrub (4%)	Estuarine Intertidal (1%)	100
Stream Process Groups	High Gradient-Contained (62%)	Moderate Gradient-Mixed Control (14%)	Moderate Gradient-Contained (11%)	Floodplain (5%)	Palustrine (3%)	
Land Use Designations	Mostly Natural Setting (62%)	Wilderness & Monument (38%)				100





Central Prince of Wales Till Lowlands

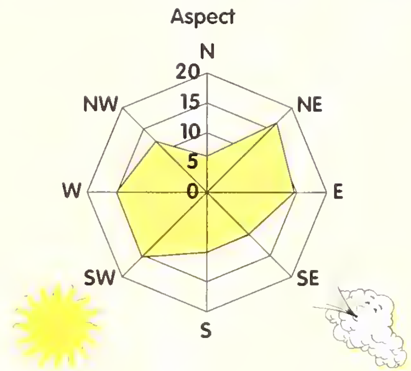
A gently undulating *terrain* exists where continental ice lobes overrode Prince of Wales Island from the northeast. Organic soils formed over deep deposits of glacial *till* support vast wetland complexes. Shallow lakes and ponds pockmark an intermixture of forested and nonforested bogs and fens. Low productive forests of mixed conifer and lodgepole pine are common on these poorly drained sites. Productive forests of hemlock and hemlock-spruce are restricted to better-drained mineral soils that occur on steeper slopes and scoured mountains and along stream cutbanks. The lack of bedrock control and relatively smooth topography allow slow-moving rivers to meander across the landscape. This lowland possesses a relatively high proportion of *floodplain and palustrine channel types*. A unique *drumlin* field (elliptical hills oriented in the direction of glacier movement) occurs within the Thorne River drainage—a rare feature in the Alexander Archipelago. Much of this area occupies the interior of Prince of Wales Island where winter snow accumulations are greater than along the coast. Surrounding mountains protect this low-lying area somewhat from North Pacific storms, yet it receives moderately high levels of precipitation. Common land animals include black bear, Sitka black-tailed deer, wolf, marten (introduced), ermine, river otter, beaver, mink, dusky shrew, northern flying squirrel, Keen's mouse, and long-tailed vole.

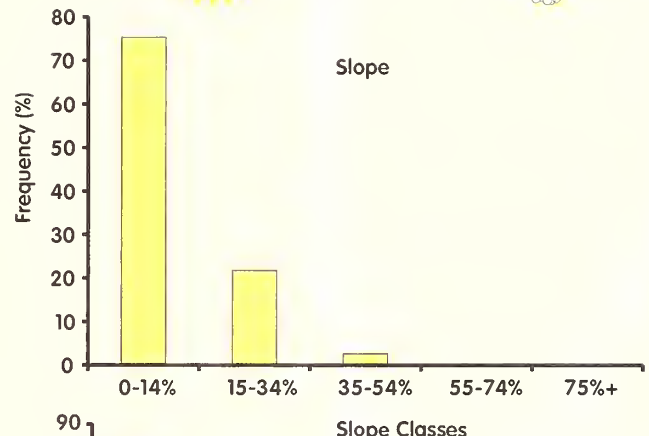


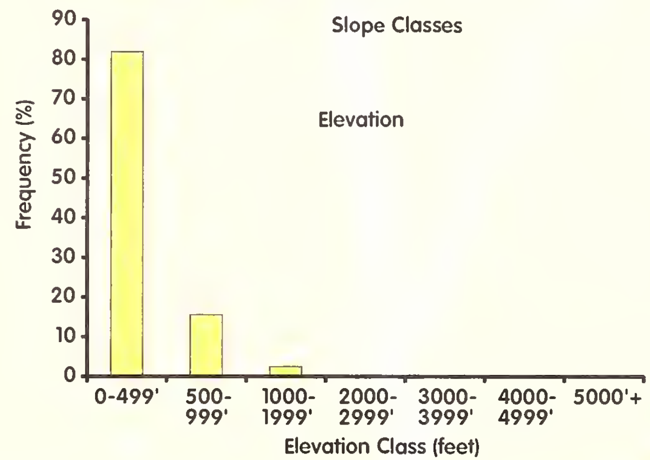
Land-Human Interactions. These lowlands spanned the territories of three Native tribes. The Stikine Tlingits resided in the northeast portion, having camps at Lake Bay (where a cannery eventually located), Whale Bay, Exchange Cove, and on Thorne Island. Beaver and salmon were caught at Barnes Lake. The Kasaan Haidas inhabited the southeast portion where highly important subsistence grounds bounded Thorne Bay, Salt Chuck, and Karta Bay. The Klawock Tlingits fished and hunted along the western portions of this subsection. A number of copper mines were developed in the early 1900s around Salt Chuck and Karta Bay. A trestled, 42-gauge railroad was constructed in 1905 to haul ore from the Rush and Brown Mine to the head of Kasaan Bay. In 1917, the Salt Chuck Mine became the first copper concentrating operation in Southeast Alaska. Using the flotation process, the mill was also able to collect rare earth elements of palladium and platinum. During its peak in the 1920s, the Salt Chuck Mine was the largest producer of palladium in the United States. Most mining operations in the area ended during World War II, although exploratory work continued in later years. This subsection has a long history of timber harvest, which peaked in the 1970s. Approximately one-quarter of the productive forest lands have been harvested to date. It possesses one of the higher road densities on the Tongass National Forest. Important salmon streams such as the Thorne, Hatchery, Logjam, and Sarkar Rivers attract many anglers.

This photograph of Barnes Lake (center), Stevenson Island (right center) and Thorne Island (background) looks north up Kashevarof Passage along the east side of Prince of Wales Island. The gently undulating landscape is characteristic of the glacially scoured terrain. Glacial till deposits support vast wetlands. Shallow lakes and ponds dot the landscape. Moderate and low productive forests occupy the more hilly terrain, some of which has been harvested.

Central POW Till Lowlands	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Hills (67%)	Mountain Slopes (13%)	Valley Floor (10%)	Lowlands (6%)	Coastal (3%)	53
Parent Materials	Organic Material (79%)	Compact Till (16%)	Alluvial (3%)	Marine Beach (1%)	Residuum (1%)	48
Soils	Histosols (81%)	Spodosols (16%)	Entisols (3%)	Inceptisols (1%)		53
Landcover	Hemlock (30%)	Mixed Conifer (17%)	Hemlock-Spruce (17%)	Lodgepole Pine (12%)	Other (10%)	100
Productivity	Productive Forests (60%)	Nonproductive Forests (29%)	Nonforested (11%)			100
Site Index	SI 41-60 (49%)	SI >80 (23%)	SI 61-80 (15%)	SI 0-40 (13%)		82
Wetlands	Palustrine Forested (46%)	Upland (41%)	Palustrine Emergent (7%)	Lacustrine Limnetic (2%)	Palustrine Scrub-Shrub (1%)	100
Stream Process Groups	High Gradient-Contained (32%)	Moderate Gradient-Contained (14%)	Moderate Gradient-Mixed Control (13%)	Palustrine (13%)	Floodplain (11%)	
Land Use Designations	Mostly Natural Setting (49%)	Intensive Development (27%)	Moderate Development (16%)	Private (8%)		100

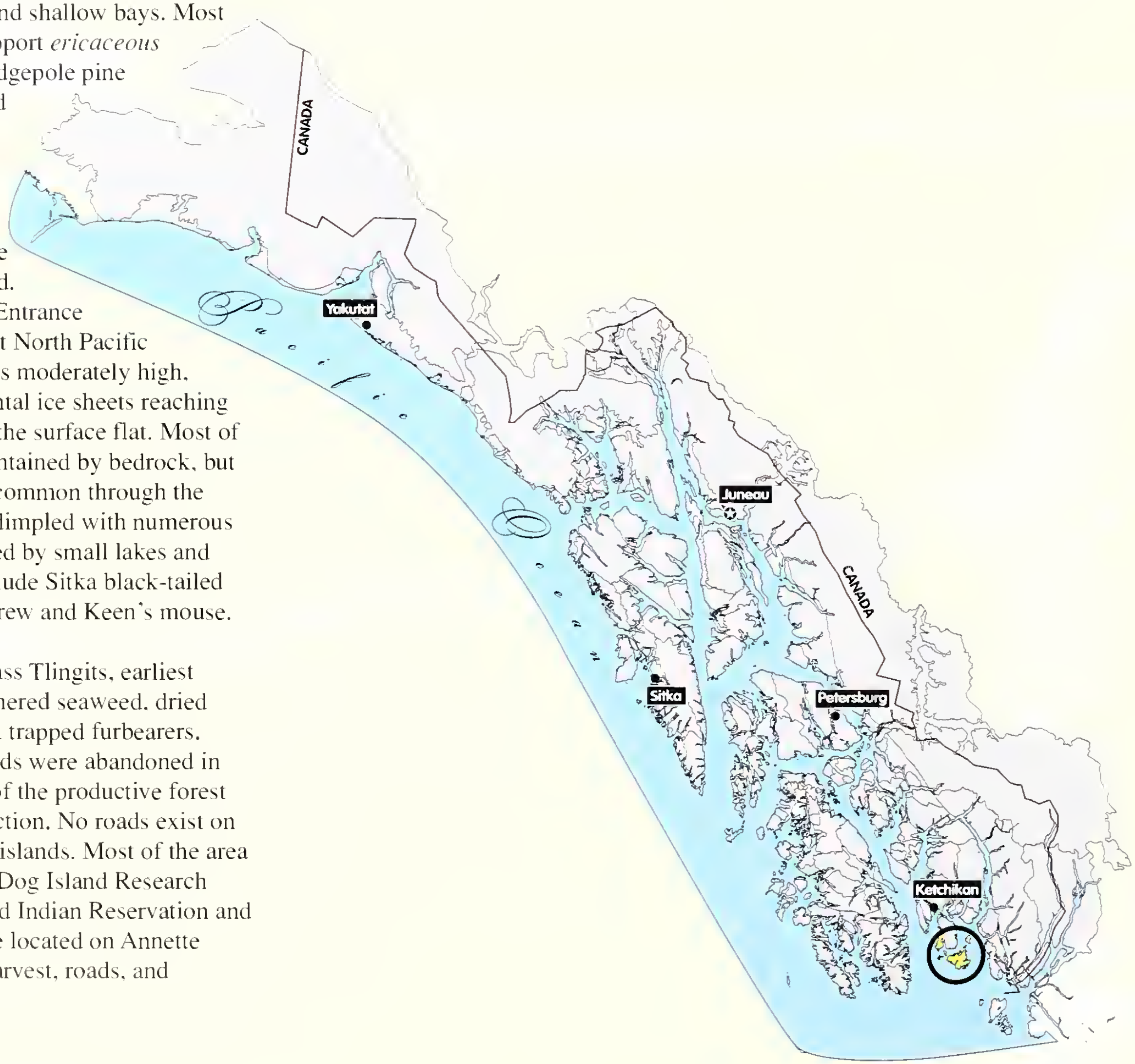




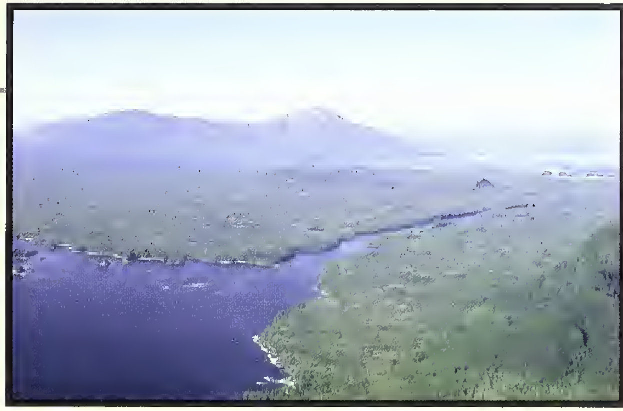


Duke Island Till Lowlands

Duke Island, Mary Island, portions of Annette Island, and adjacent small islands represent glacially overridden bedrock platforms surrounded by coastal reefs and shallow bays. Most surfaces are wet and peat-based and support *ericaceous shrubs* and low-productive forests of lodgepole pine and mixed conifers. Organic mats shield underlying mafic and ultramafic rocks—the latter of which can have deleterious effects on plant life. However, ultramafic rocks are exposed at two locations: Mount Lazaro on Duke Island and Yellow Hill on Annette Island. The location at the north end of Dixon Entrance exposes this group of islands to frequent North Pacific storms and strong winds. Precipitation is moderately high, averaging 110 inches per year. Continental ice sheets reaching this area during the *Pleistocene* planed the surface flat. Most of the streams have moderate gradients contained by bedrock, but shallow, meandering channels are also common through the peatlands. The generally flat *terrain* is dimpled with numerous depressions, many of which are occupied by small lakes and ponds. Common lowland mammals include Sitka black-tailed deer, beaver, river otter, mink, dusky shrew and Keen's mouse.

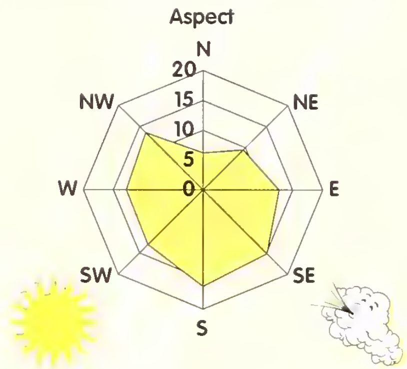


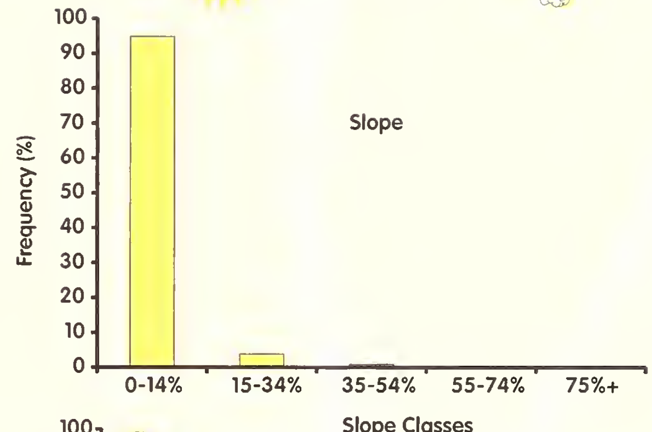
Land-Human Interactions. The Tongass Tlingits, earliest known inhabitants on these islands, gathered seaweed, dried halibut, and hunted seal and beaver, and trapped furbearers. Native villages on Cat and Village Islands were abandoned in the late 1800s. To date, only 3 percent of the productive forest lands have been harvested in this subsection. No roads exist on Duke Island and the smaller associated islands. Most of the area is managed for natural settings and the Dog Island Research Natural Area occurs here. Annette Island Indian Reservation and the Native community of Metlakatla are located on Annette Island, where human activity (timber harvest, roads, and development) is more extensive.

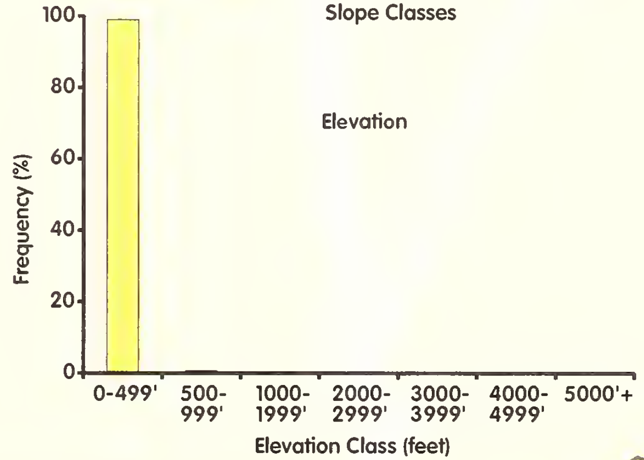


A view looking northward over glacially scoured Duke Island. Hall Cove, in the foreground, dissects the nearly flat topography of this island. Here, massive continental glaciers sheared the island leaving compact glacial till soils underlying vast wetlands. The most outstanding feature in this subsection is Mt. Lazaro, a small portion of which appears in the lower right corner. Mt. Lazaro stands about 1,700 feet in elevation—a formidable feature of resistant gabbro amongst the lowland till deposits. The Clarence Strait Volcanics of Annette Island are seen in the background.

Duke Island Till Lowlands	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (96%)	Coastal (2%)	Valley Floor (1%)			68
Parent Materials	Organic Material (93%)	Marine Beach (2%)	Glacial Till (2%)	Alluvial (1%)	Residuum (1%)	68
Soils	Histosols (93%)	Inceptisols (4%)	Entisols (1%)	Spodosols (1%)		68
Landcover	Brush (30%)	Lodgepole Pine (28%)	Mixed Conifer (26%)	Hemlock-Spruce (6%)	Hemlock (5%)	100
Productivity	Nonproductive Forests (54%)	Nonforested (34%)	Productive Forests (13%)			100
Site Index	SI 0-40 (36%)	SI >80 (35%)	SI 41-60 (29%)			100
Wetlands	Palustrine Scrub-Shrub (26%)	Palustrine Forested (26%)	Upland (25%)	Palustrine Emergent (19%)	Palustrine Unconsolidated Bottom (2%)	100
Stream Process Groups	Moderate Gradient-Contained (36%)	Palustrine (24%)	Lake (21%)	Moderate Gradient-Mixed Control (8%)	Floodplain (6%)	
Land Use Designations	Mostly Natural Setting (72%)	Private (27%)				100



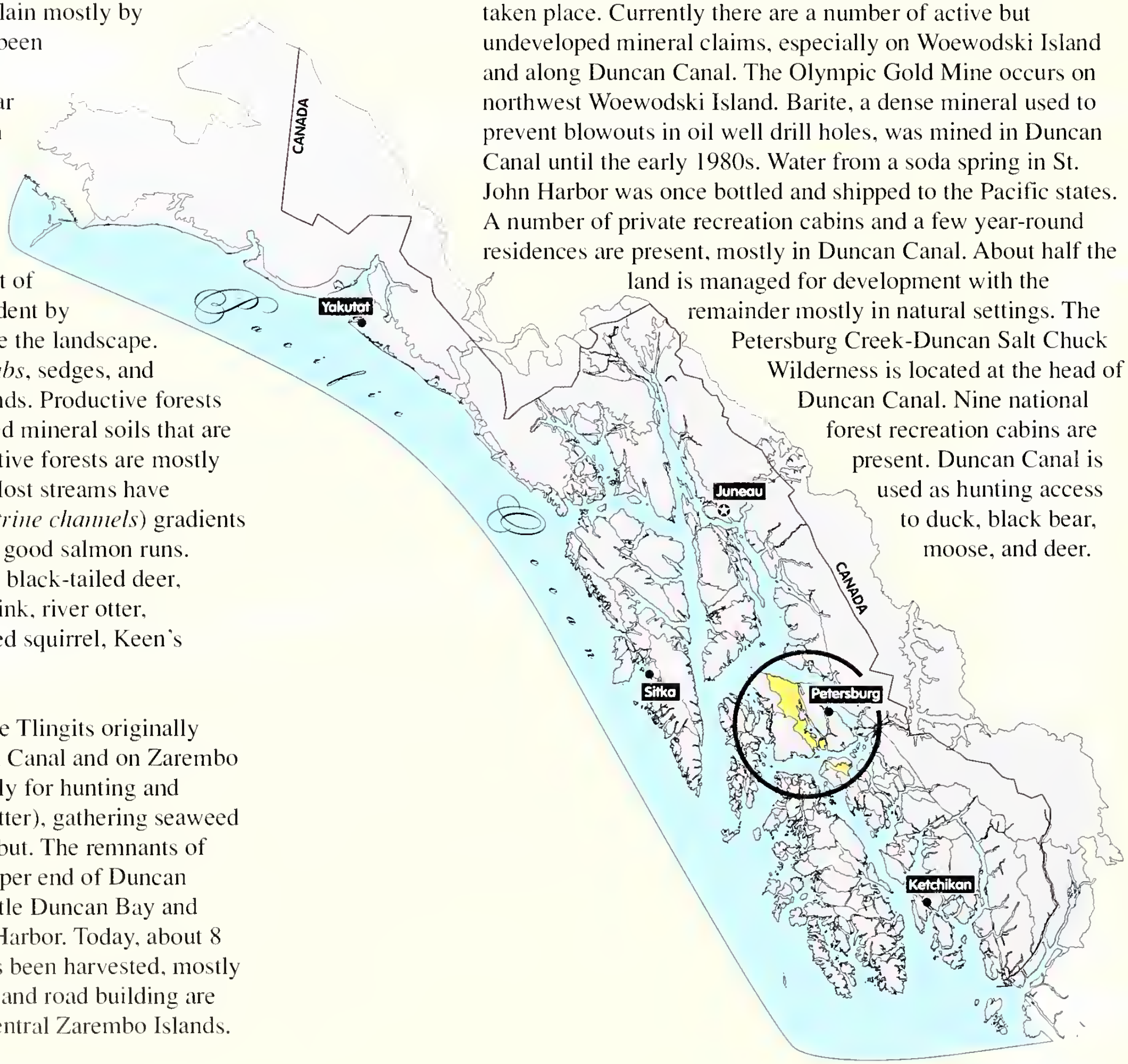


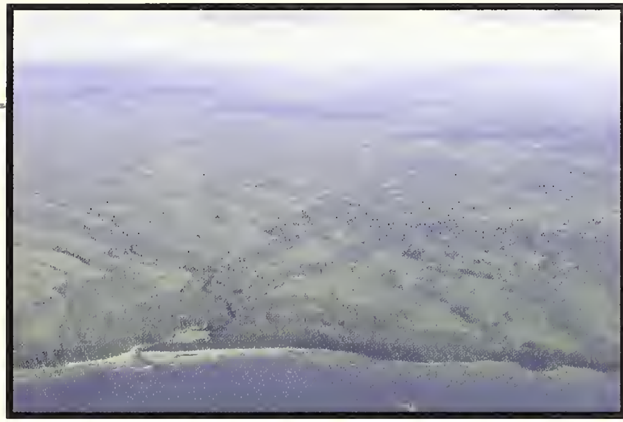


Duncan Canal Till Lowlands

This wetland-rich subsection lies in a broad saddle between higher *terrains* on Kupreanof and Zarembo Islands. The subdued, low-lying topography is underlain mostly by sedimentary and volcanic rock that has been metamorphosed. *Surficial deposits* of unconsolidated materials are present near Castle River on Kupreanof Island and in the central valley of Zarembo Island from Meter Bight to Saint John's Harbor. The gentle relief, abundance of glacial *till* and drift, and moderately high precipitation favor the development of poorly drained organic soils. This is evident by the abundance of wetlands that dominate the landscape. Stunted lodgepole pine, *ericaceous shrubs*, sedges, and mosses mostly characterize these wetlands. Productive forests are mainly restricted to the better-drained mineral soils that are found along slopes and streams. Productive forests are mostly hemlock with some spruce and cedar. Most streams have moderate or low (*floodplains and palustrine channels*) gradients and some, such as Castle River, support good salmon runs. These lowlands harbor black bear, Sitka black-tailed deer, moose, wolf, marten, beaver, ermine, mink, river otter, porcupine, common and dusky shrew, red squirrel, Keen's mouse, and long-tailed vole.

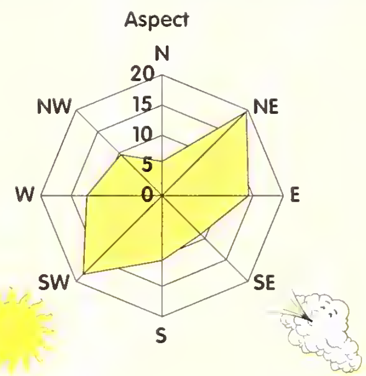
Land-Human Interactions. The Stikine Tlingits originally inhabited the lands surrounding Duncan Canal and on Zarembo Island. These areas were used extensively for hunting and trapping (bear, deer, beaver, mink and otter), gathering seaweed and berries, and drying salmon and halibut. The remnants of stone fish traps are still visible in the upper end of Duncan Canal. There was a Native village at Little Duncan Bay and camps at Kah Sheets Bay and St. John Harbor. Today, about 8 percent of the productive forest land has been harvested, mostly in the 1970s and 1980s. Timber harvest and road building are concentrated on north Kupreanof and central Zarembo Islands. Road density is moderate. The area is rich in extractable minerals (gold, silver, and zinc) and much exploration has taken place. Currently there are a number of active but undeveloped mineral claims, especially on Woewodski Island and along Duncan Canal. The Olympic Gold Mine occurs on northwest Woewodski Island. Barite, a dense mineral used to prevent blowouts in oil well drill holes, was mined in Duncan Canal until the early 1980s. Water from a soda spring in St. John Harbor was once bottled and shipped to the Pacific states. A number of private recreation cabins and a few year-round residences are present, mostly in Duncan Canal. About half the land is managed for development with the remainder mostly in natural settings. The Petersburg Creek-Duncan Salt Chuck Wilderness is located at the head of Duncan Canal. Nine national forest recreation cabins are present. Duncan Canal is used as hunting access to duck, black bear, moose, and deer.

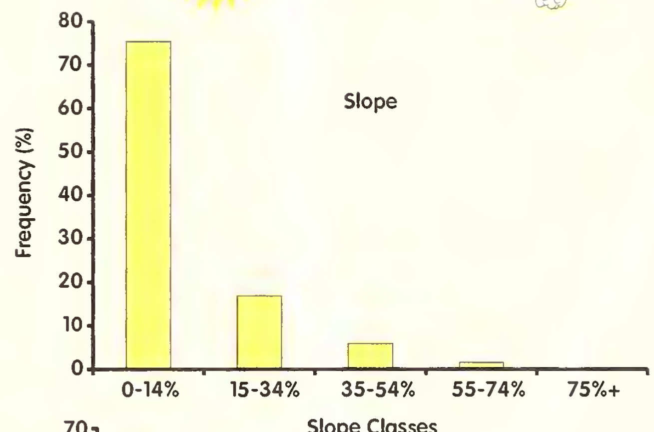


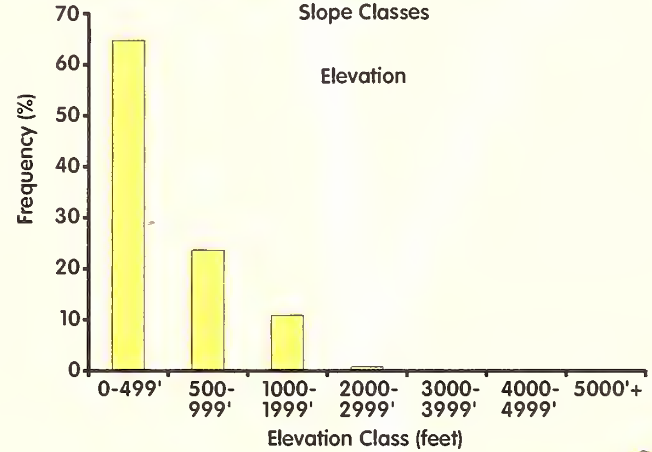


Looking south over the north shore of Kupreanof Island from Frederick Sound. The mouth of Big Creek is located just left of center. Poorly drained organic soils underlie a mosaic of open and forested wetlands covering the gentle topography. Stunted lodgepole pine, ericaceous shrubs, sedges, and sphagnum mosses are common plants on wetland soils.

Duncan Canal Till Lowlands	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Lowlands (64%)	Mountain Slopes (24%)	Hills (6%)	Valley Floor (4%)	Mountain Summits (1%)	99
Parent Materials	Colluvium (25%)	Residuum (22%)	Glacial Drift (17%)	Compact Till (17%)	Ablation Till (11%)	44
Soils	Histosols (69%)	Spodosols (28%)	Entisols (2%)	Inceptisols (1%)		99
Landcover	Lodgepole Pine (28%)	Hemlock (23%)	Mixed Conifer (20%)	Marsh (11%)	Hemlock-Spruce (11%)	100
Productivity	Nonproductive Forests (52%)	Productive Forests (36%)	Nonforested (13%)			100
Site Index	SI 0-40 (58%)	SI 41-60 (20%)	SI 61-80 (14%)	SI >80 (8%)		100
Wetlands	Palustrine Forested (42%)	Upland (29%)	Palustrine Emergent (25%)	Palustrine Scrub-Shrub (2%)	Estuarine Intertidal (1%)	100
Stream Process Groups	High Gradient-Contained (21%)	Moderate Gradient-Mixed Control (19%)	Floodplain (18%)	Moderate Gradient-Contained (16%)	Palustrine (12%)	
Land Use Designations	Intensive Development (43%)	Mostly Natural Setting (40%)	Moderate Development (10%)	Wilderness & Monument (6%)	Private (1%)	100



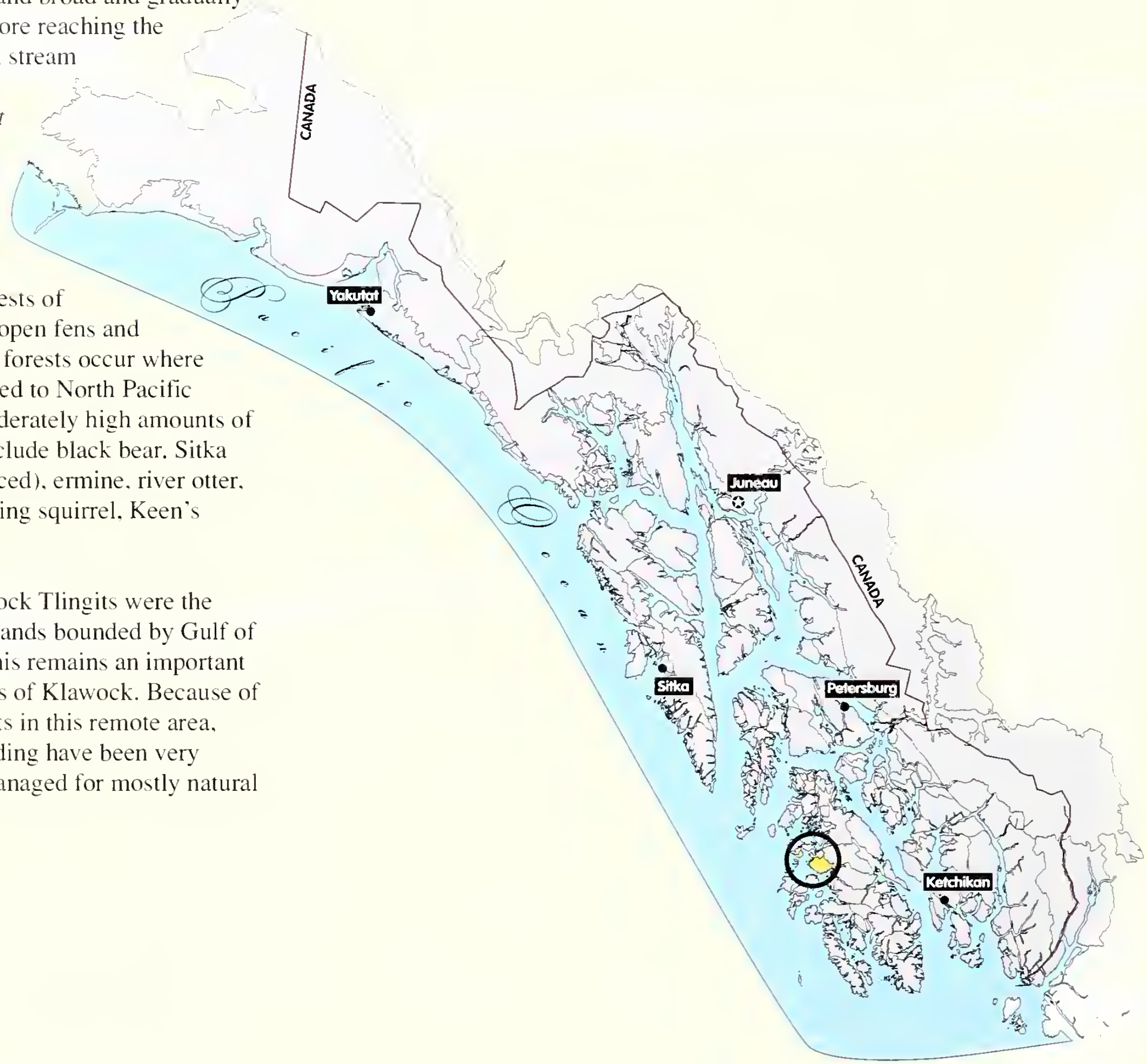




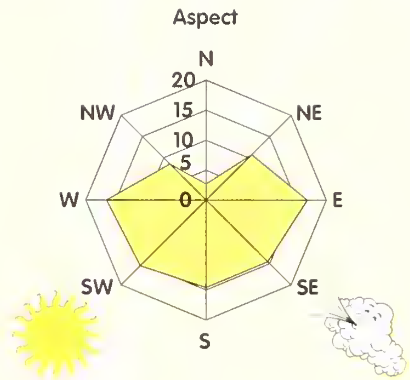
Elevenmile Till Lowlands

This heavily glaciated area consists of sloping *terrain* on the west side of Prince of Wales Island and south side of Heceta Island. The mountain slopes are gentle and broad and gradually change to rolling hills and lowlands before reaching the ocean. Consistent with these landforms, stream character changes from *high gradient, contained to moderate and low gradient* conditions. Compact glacial *tills* and peat of various thickness cover most of the sedimentary and volcanic bedrock. The gentle *terrain* coupled with soil impermeability has led to an expansive wetland complex. Shrubby, wetland forests of lodgepole pine and mixed conifers and open fens and bogs are abundant. Productive hemlock forests occur where soil drainage permits. The area is exposed to North Pacific storms and high winds and receives moderately high amounts of precipitation. Common land animals include black bear, Sitka black-tailed deer, wolf, marten (introduced), ermine, river otter, beaver, mink, dusky shrew, northern flying squirrel, Keen's mouse, and long-tailed vole.

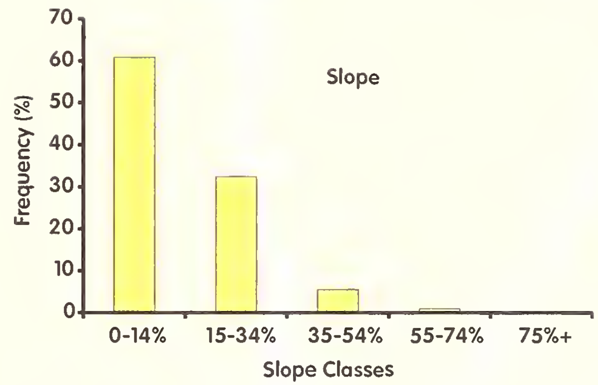
Land-Human Interactions. The Klawock Tlingits were the earliest known inhabitants of these lowlands bounded by Gulf of Esquibel and San Cristoval Channel. This remains an important subsistence area for the nearby residents of Klawock. Because of the marginal value of commercial forests in this remote area, timber harvest and associated road building have been very limited. Most of the area is currently managed for mostly natural settings.

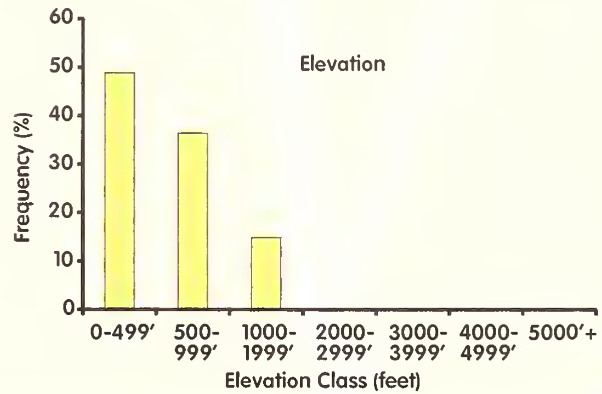


This photograph looks south over the southwest end of Salt Lake Bay (lower left) across the west side of Central Prince of Wales Island. The water body shown in the mid-ground is the San Christoval Channel. This photo shows the dramatically flat terrain typical of this subsection, resulting from the erosive force of continental glaciers that repeatedly scoured the landscape. San Fernando Island lies in the background.



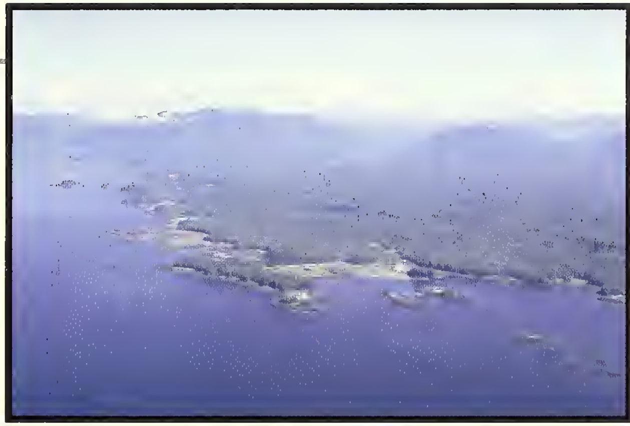
Elevenmile Till Lowlands	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (47%)	Hills (32%)	Valley Floor (15%)	Coastal (3%)	Lowlands (3%)	71
Parent Materials	Organic Material (69%)	Compact Till (28%)	Marine Beach (3%)	Alluvial (1%)		67
Soils	Histosols (71%)	Spodosols (26%)	Inceptisols (2%)	Entisols (1%)		71
Landcover	Lodgepole Pine (30%)	Hemlock (22%)	Mixed Conifer (18%)	Marsh (10%)	Hemlock-Spruce (9%)	100
Productivity	Nonproductive Forests (48%)	Productive Forests (32%)	Nonforested (19%)			100
Site Index	SI 0-40 (37%)	SI 41-60 (26%)	SI 61-80 (22%)	SI >80 (15%)		84
Wetlands	Palustrine Forested (47%)	Upland (27%)	Palustrine Emergent (15%)	Palustrine Scrub-Shrub (9%)		100
Stream Process Groups	High Gradient-Contained (64%)	Moderate Gradient-Mixed Control (14%)	Moderate Gradient-Contained (10%)	Floodplain (5%)	Low Gradient-Contained (3%)	
Land Use Designations	Mostly Natural Setting (53%)	Intensive Development (38%)	Private (9%)			100



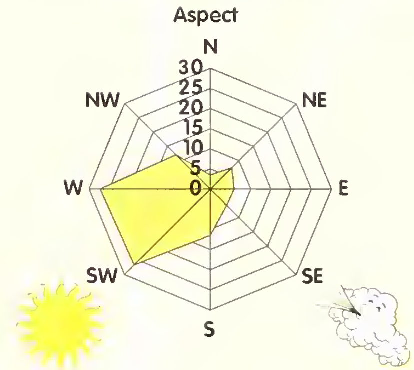


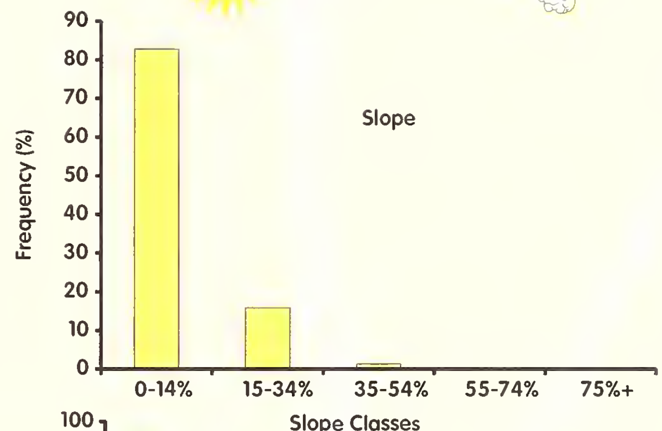
This is a low, glacially eroded terrace that forms the northeastern shore of Dixon Entrance extending from Cape Fox to Sykes Cove. Continental ice sheets heavily scoured this part of the mainland, exposing the underlying metasediments. This expansive coastal lowland is an uncommon feature along the Boundary Ranges portion of the mainland. The area is mainly peat covered, pockmarked with small lakes and ponds, and fringed by convoluted shorelines on its west side. Wet, scrubby forests of lodgepole pine and mixed conifers are abundant, interspersed with open bogs and fens. Containment varies as streams flow through segments of bedrock and *till* deposits. *Moderate to low (floodplain) gradient streams* dominate. This peninsula is exposed to strong surf and winds and moderately high rainfall from North Pacific storms moving through Dixon Entrance. These coastal lowlands harbor black and brown bear, Sitka black-tailed deer, wolf, porcupine, red and northern flying squirrel, and common and dusky shrew.

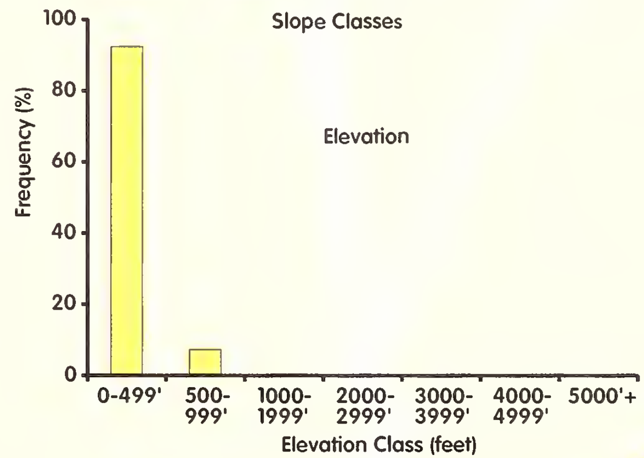
Land-Human Interactions. The Saxman Tlingits were the earliest known inhabitants of these lands, fishing and gathering seaweed and shellfish along shorelines from Cape Fox to Sykes Cove. Important halibut banks were located offshore. Saxman's main village, called Cape Fox Village, stood on Kirk Point prior to its relocation south of Ketchikan in 1893 (Goldschmidt and Haas 1998). Kah Shakes Cove was a very important cultural and subsistence center, with a village, cemetery, gardens, and rich hunting, fishing, trapping, and berry grounds. Currently, this is truly one of the most remote, relatively unaltered landscapes of Southeast Alaska. Its remoteness and lack of commercial forests and minerals limited human interest in the past. Its protection is ensured through Misty Fiords National Monument Wilderness designation. The Kah-Shakes Herring Fishery occurs near Kah Shakes Cove.



Kirk Point, along the western shore of the southern mainland, represents yet another scoured landscape in Southeast Alaska, with its nearly level terrain—the mark of massive continental ice sheets flowing over erodible substrates. This gently undulating landscape of exposed metasediments and glacial till deposits, an uncommon feature along this portion of the mainland coast, occurs just south of Behm Canal. Revillagigedo Channel lies in the foreground, whereas the rounded hills of the Boca de Quadra Complex are in the background.





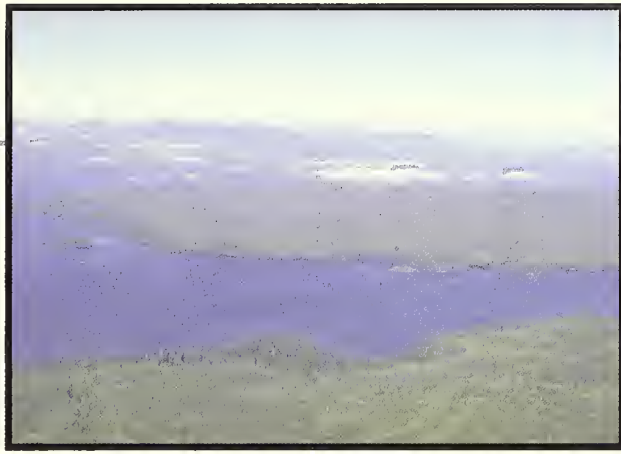


Foggy Bay Till Lowlands	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms						0
Parent Materials						0
Soils						0
Landcover	Lodgepole Pine (36%)	Hemlock (24%)	Mixed Conifer (21%)	Hemlock-Spruce (13%)	Brush (5%)	100
Productivity	Nonproductive Forests (59%)	Productive Forests (37%)	Nonforested (5%)			100
Site Index	SI 0-40 (85%)	SI >80 (16%)				100
Wetlands	Palustrine Forested (50%)	Upland (20%)	Palustrine Scrub-Shrub (18%)	Palustrine Emergent (8%)	Palustrine Unconsolidated Bottom (2%)	100
Stream Process Groups	Moderate Gradient-Mixed Control (34%)	Moderate Gradient-Contained (20%)	High Gradient-Contained (13%)	Lake (11%)	Floodplain (10%)	
Land Use Designations	Wilderness & Monument (100%)					100

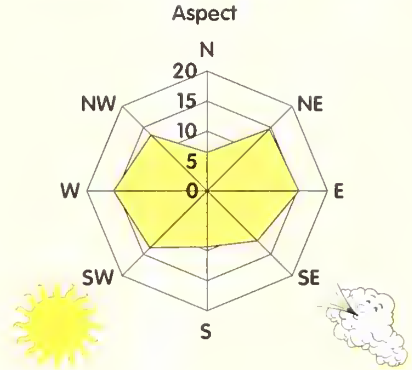
Gulf of Esquibel Till Lowlands

This subsection spans the Gulf of Esquibel and includes two large islands of Lulu and San Fernando and a myriad of smaller ones known as the Maurelle Islands. With the maximum elevation of about 1,100 feet, this relatively flat to rolling landscape is dominated by low productivity, mixed conifer wetlands on organic soils and more productive forests on better-drained hummocks and hillslopes. The remainder of the area includes wetlands with scattered lodgepole pine, open peatlands, and a few small lakes. Most soils have developed in glacial *till*. Lulu and San Fernando Islands are protected from ocean waves by islands to the west, whereas the Maurelle Islands are more exposed. These islands are impacted by the strong North Pacific storms and receive about 103 inches of rainfall a year. Many of the stream channels have moderate gradients and are contained to various degrees by the sedimentary and volcanic bedrock. The number of mammal species is limited on these islands by geographic isolation and distance from the mainland (MacDonald and Cook 1996). Common mammals include Sitka black-tailed deer, wolf, mink, river otter, dusky shrew, and Keen's mouse.

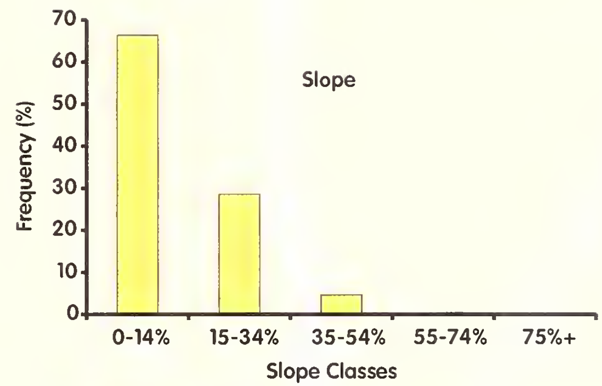
Land-Human Interactions. The Klawock Tlingits were the earliest known inhabitants of these lowlands. These islands continue to be important subsistence hunting, gathering, and fishing areas for local Natives, primarily Klawock village residents. Lulu Island is included in the Outside Islands Congressionally Designated Roadless Area, whereas San Fernando Island is open to semi-remote recreation. The Maurelle Islands Wilderness occurs here. No timber harvest or construction of roads is scheduled under the 1999 Tongass Land Management Plan Revision, but isolated Sitka spruce logging did occur during World War II.

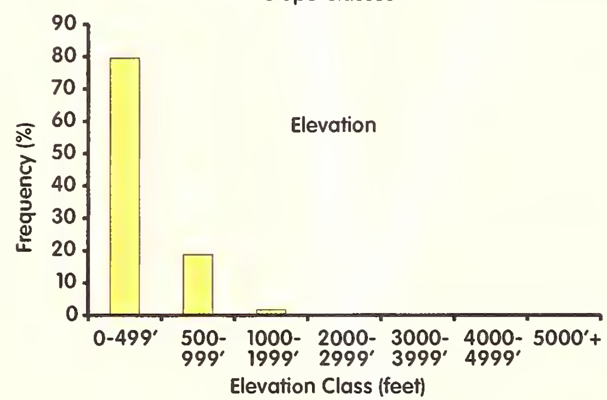


This photograph of Lulu Island looking east to San Fernando Island represents the gently rolling terrain of the Gulf of Esquibel Till Lowlands. The undulating nature of this landscape results in a greater expanse of low productivity forests than compared other lowland subsections, such as the Elevenmile Till Lowlands to the east. Forested, scrub-shrub, and emergent wetlands frequently occur on glacial till deposits.



Gulf of Esquibel Till Lowlands	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (69%)	Hills (12%)	Coastal (12%)	Valley Floor (7%)		91
Parent Materials	Colluvium (44%)	Compact Till (31%)	Organic Material (15%)	Marine Beach (8%)	Glacial Drift (1%)	87
Soils	Spodosols (72%)	Histosols (19%)	Inceptisols (8%)	Entisols (1%)		91
Landcover	Mixed Conifer (42%)	Hemlock (25%)	Lodgepole Pine (24%)	Hemlock-Spruce (6%)	Brush (1%)	100
Productivity	Nonproductive Forests (66%)	Productive Forests (32%)	Nonforested (2%)			100
Site Index	SI 41-60 (41%)	SI 61-80 (28%)	SI >80 (24%)	SI 0-40 (7%)		99
Wetlands	Palustrine Forested (52%)	Upland (32%)	Palustrine Emergent (13%)	Palustrine Scrub-Shrub (1%)	Estuarine Intertidal (1%)	99
Stream Process Groups	High Gradient-Contained (44%)	Moderate Gradient-Contained (35%)	Moderate Gradient-Mixed Control (12%)	Floodplain (3%)	Lake (3%)	
Land Use Designations	Mostly Natural Setting (88%)	Wilderness & Monument (12%)				100

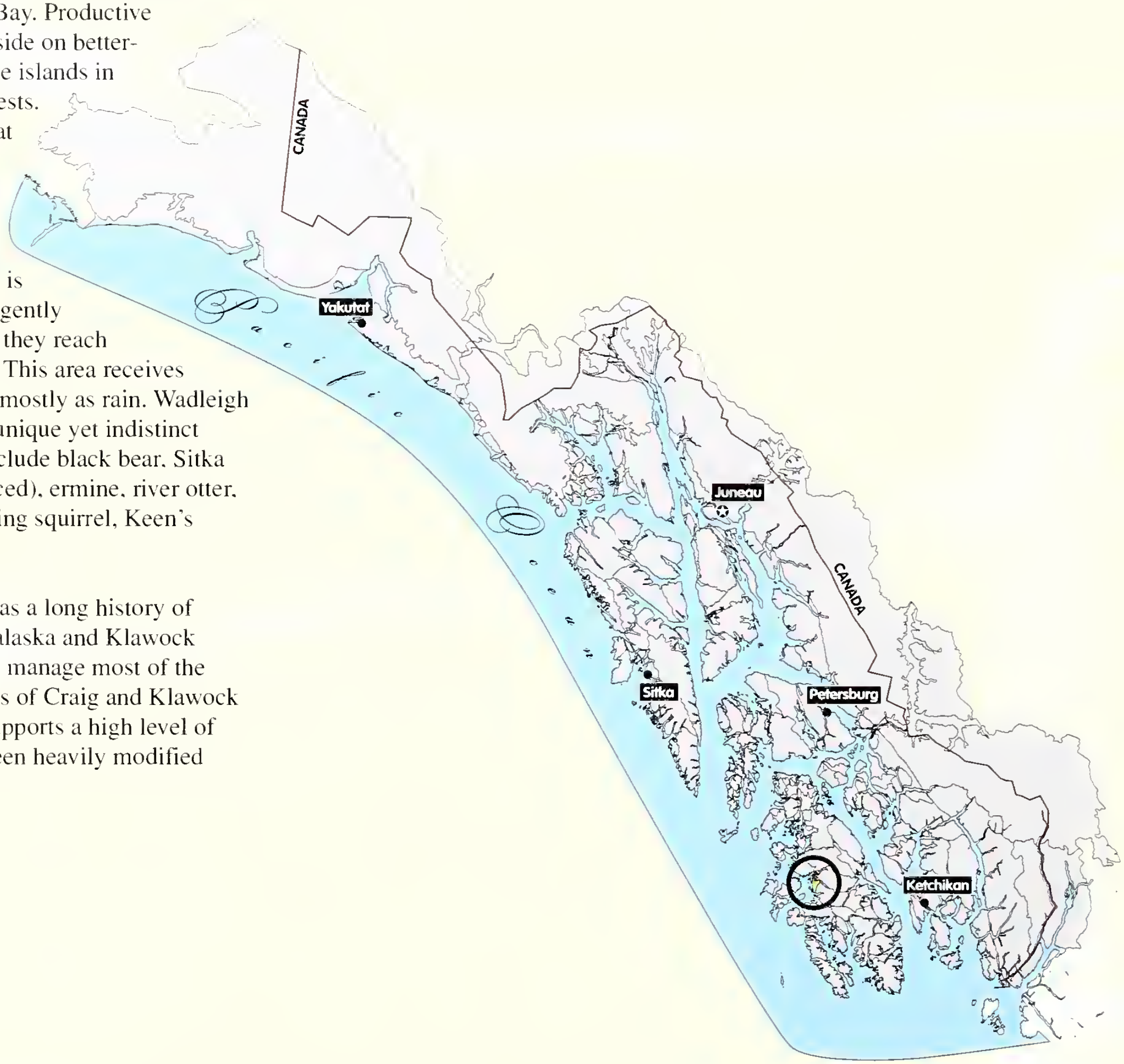




Klawock Inlet Till Lowlands

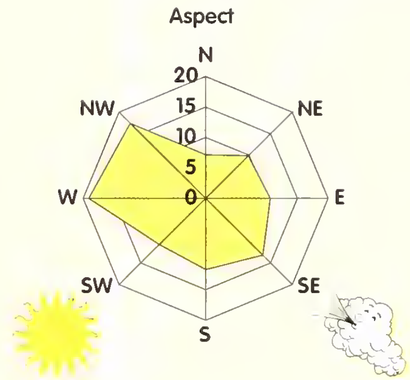
Glacially overridden slopes of carbonate and sedimentary rocks descend from the outlet of Klawock Lake westward towards a myriad of small islands in San Alberto Bay. Productive hemlock and hemlock-spruce forests reside on better-drained slopes with bedrock contact. The islands in particular support highly productive forests. Areas overlain with compact *till* and peat are poorly drained and support an intermixture of forested wetlands and open bogs and fens. Swift, *high gradient, contained streams* descend mountain and hill slopes where bedrock is near the surface. Streams become more gently flowing with reduced containment once they reach larger floodplains and coastal lowlands. This area receives moderately high levels of precipitation, mostly as rain. Wadleigh Island is a large island that possesses a unique yet indistinct *drumlin* field. Common land animals include black bear, Sitka black-tailed deer, wolf, marten (introduced), ermine, river otter, beaver, mink, dusky shrew, northern flying squirrel, Keen's mouse, and long-tailed vole.

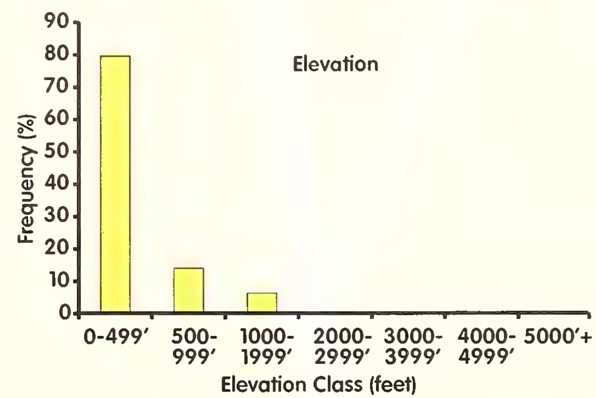
Land-Human Interactions. The area has a long history of human use by the Klawock Tlingits. Sealaska and Klawock Heenya Corporations currently own and manage most of the land in this subsection. The communities of Craig and Klawock occur here. A dense network of roads supports a high level of timber harvest in this area, which has been heavily modified through recent human activity.



A view of Wadleigh Island looking northeast to the City of Klawock (far upper right) illustrates the glacially overridden carbonates and other sedimentary rocks of this region. This subsection includes the small islands within Klawock Inlet and extends southward from here along the western shore of Prince of Wales Island to the City of Craig. Forested wetlands are dominant, with productive forests dotting the landscape where topography is steeper.

Klawock Inlet Till Lowlands	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (41%)	Coastal (25%)	Valley Floor (17%)	Hills (14%)	Lowlands (2%)	38
Parent Materials	Compact Till (41%)	Organic Material (23%)	Alluvial (16%)	Marine Beach (16%)	Colluvium (3%)	33
Soils	Spodosols (39%)	Histosols (32%)	Entisols (14%)	Inceptisols (14%)	Miscellaneous (1%)	38
Landcover	Rock (62%)	Brush (30%)	Hemlock-Spruce (2%)	Hemlock (2%)	Other (1%)	100
Productivity	Nonforested (86%)	Productive Forests (13%)	Nonproductive Forests (2%)			100
Site Index	SI >80 (63%)	SI 61-80 (20%)	SI 41-60 (9%)	SI 0-40 (8%)		72
Wetlands	Upland (67%)	Palustrine Forested (23%)	Palustrine Emergent (4%)	Palustrine Scrub-Shrub (3%)	Estuarine Subtidal (2%)	100
Stream Process Groups	High Gradient-Contained (39%)	Floodplain (34%)	Moderate Gradient-Mixed Control (12%)	Lake (5%)	Estuary (4%)	
Land Use Designations	Private (95%)	Mostly Natural Setting (5%)				100

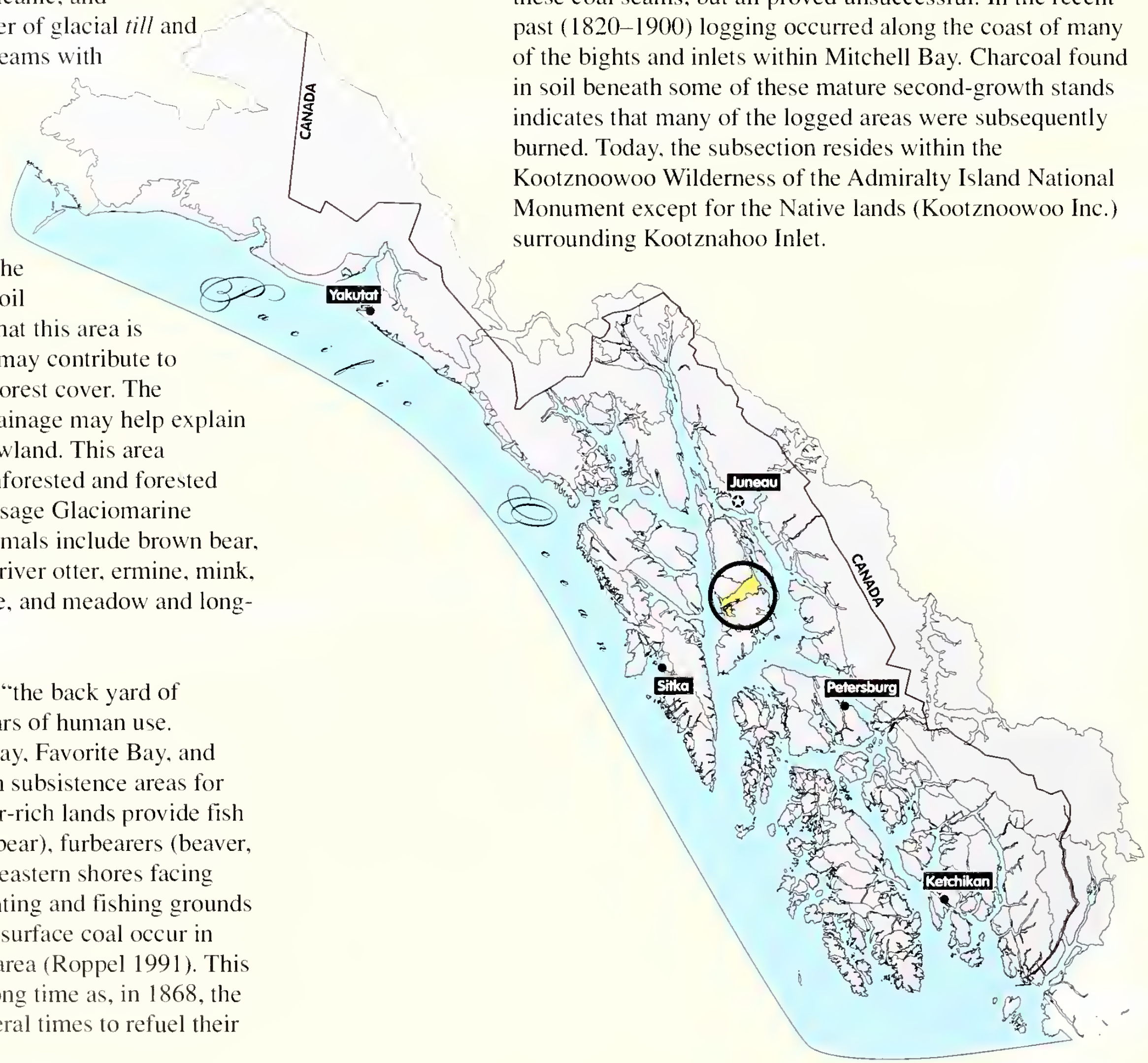


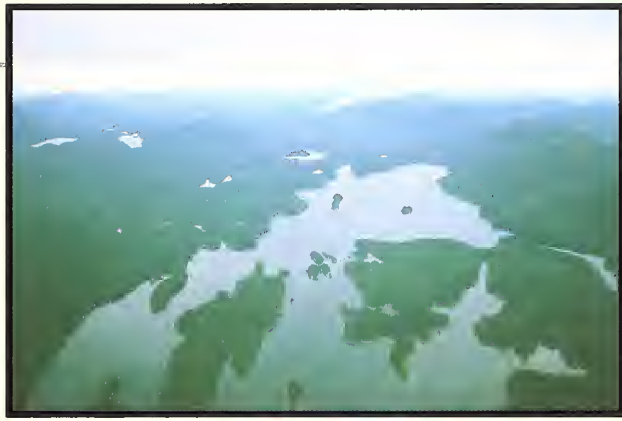


Mitchell–Hasselborg Till Lowlands

Undulating lowlands, pockmarked with lakes and small kettle ponds, slice through the heart of Admiralty Island. Continental ice heavily scoured the sedimentary, volcanic, and metamorphic rocks, leaving a thin veneer of glacial *till* and *glaciomarine* sediments in its wake. Streams with heavy *bedloads* pour off surrounding highlands and feed numerous small *floodplains and palustrine channels* as they enter this lowland. Surface organics range from 6 to 15 inches on the mineral soils to many feet thick on wet surfaces. In spite of the flatness of the *terrain* and the thick organic build up, soil drainage is remarkably good. The fact that this area is one of the "driest" in Southeast Alaska may contribute to fewer wetlands and greater productive forest cover. The moderate precipitation and good soil drainage may help explain why forests are so common over this lowland. This area contrasts sharply with the extensive nonforested and forested wetland complexes on the Stephens Passage Glaciomarine Terraces to the north. Common land animals include brown bear, Sitka black-tailed deer, marten, beaver, river otter, ermine, mink, dusky shrew, red squirrel, Keen's mouse, and meadow and long-tailed vole.

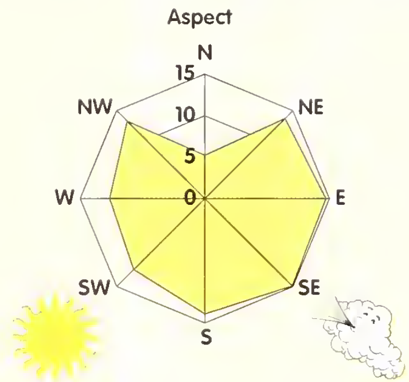
Land-Human Interactions. This area, "the back yard of Angoon," has received thousands of years of human use. Kootznahoo Inlet (including Mitchell Bay, Favorite Bay, and Kanalku Bay) and interior lakes are rich subsistence areas for the Angoon Tlingit. These surface-water-rich lands provide fish (herring, salmon, halibut), game (deer, bear), furbearers (beaver, mink, otter), seaweed, and berries. The eastern shores facing Seymour Canal were the traditional hunting and fishing grounds of the Auk Tlingits. Small quantities of surface coal occur in various places in the Kootznahoo Inlet area (Roppel 1991). This resource must have been known for a long time as, in 1868, the U.S. Navy stopped at Kanalku Bay several times to refuel their streamer, Saginaw, during their exploration of the *archipelago*. There were many attempts to profitably exploit these coal seams, but all proved unsuccessful. In the recent past (1820–1900) logging occurred along the coast of many of the bights and inlets within Mitchell Bay. Charcoal found in soil beneath some of these mature second-growth stands indicates that many of the logged areas were subsequently burned. Today, the subsection resides within the Kootznoowoo Wilderness of the Admiralty Island National Monument except for the Native lands (Kootznoowoo Inc.) surrounding Kootznahoo Inlet.

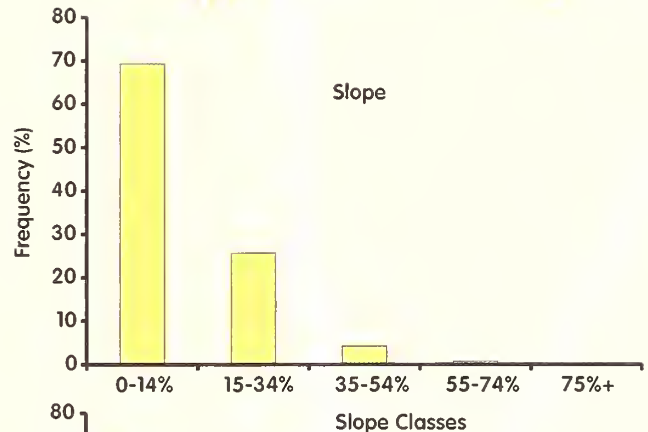


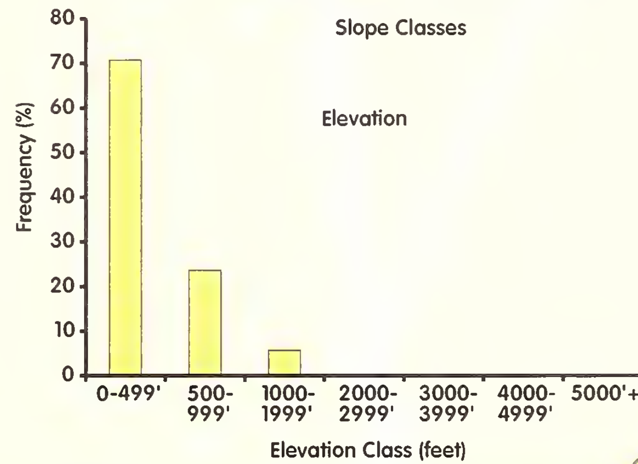


A view looking east over Mitchell Bay. The bedrock-controlled texture of the islands following the vertical bedding planes is clearly visible in the foreground. Distin and Davidson Lakes can be seen on the left side of the photograph. The Boundary Range Icefields (mainland) are in the distant background.

Mitchell-Hasselborg Till Lowlands	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms						0
Parent Materials						0
Soils						0
Landcover	Hemlock (38%)	Hemlock-Spruce (33%)	Lodgepole Pine (16%)	Mixed Conifer (7%)	Brush (6%)	100
Productivity	Productive Forests (71%)	Nonproductive Forests (23%)	Nonforested (7%)			100
Site Index						0
Wetlands	Upland (48%)	Palustrine Forested (37%)	Palustrine Emergent (5%)	Lacustrine Limnetic (5%)	Palustrine Scrub-Shrub (4%)	100
Stream Process Groups	Floodplain (23%)	Lake (17%)	High Gradient-Contained (16%)	Moderate Gradient-Contained (14%)	Palustrine (10%)	
Land Use Designations	Wilderness & Monument (95%)	Private (5%)				100



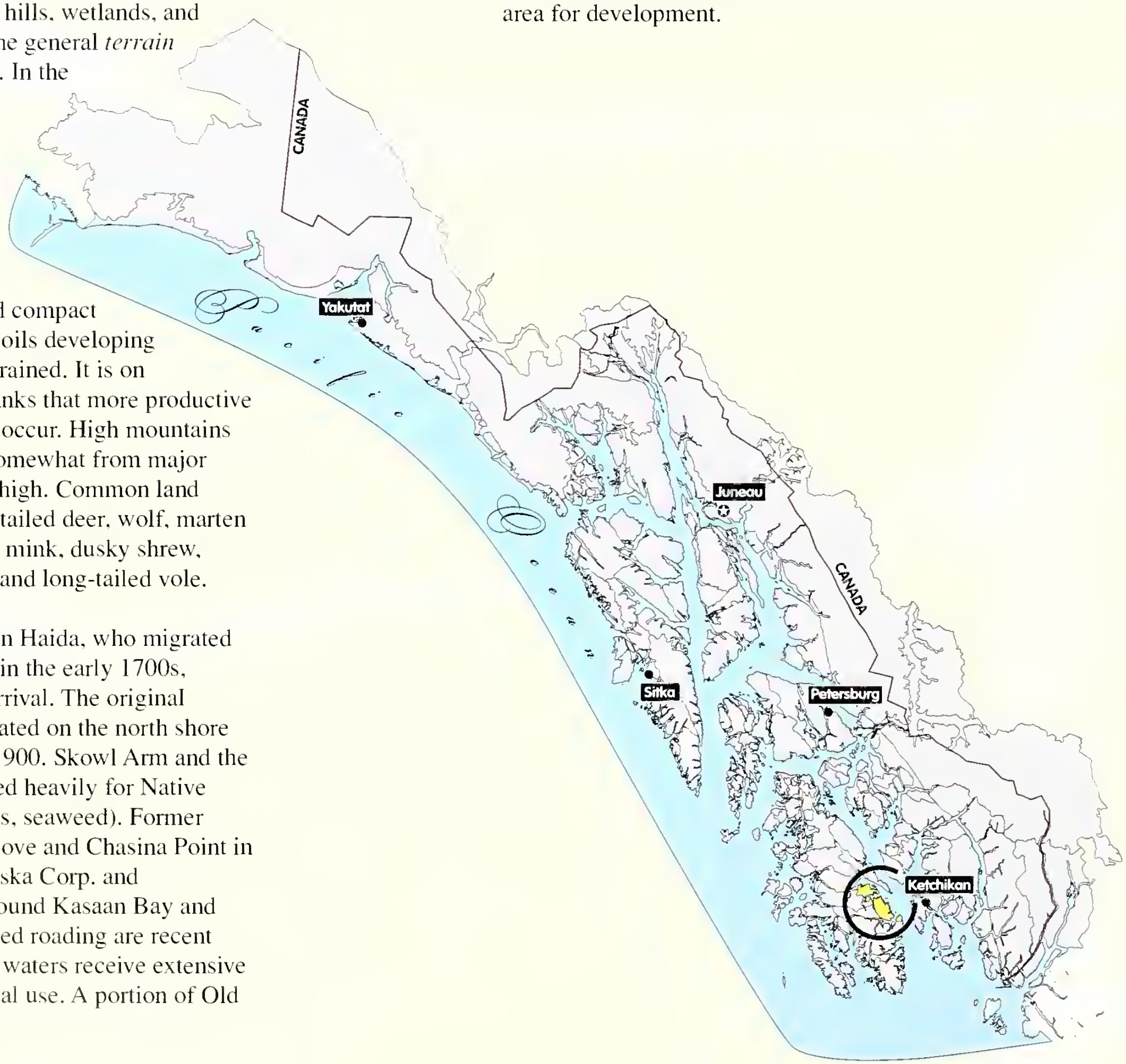


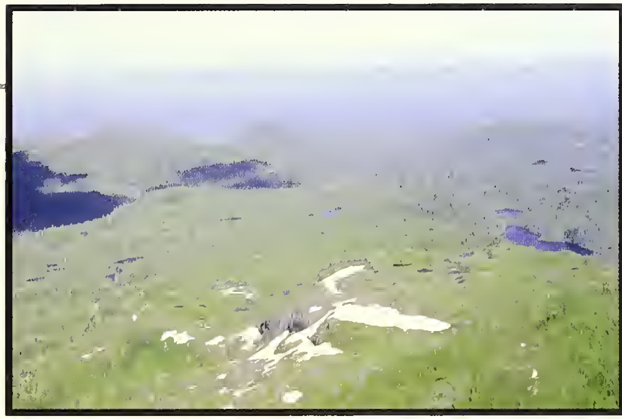


Skowl Arm Till Lowlands

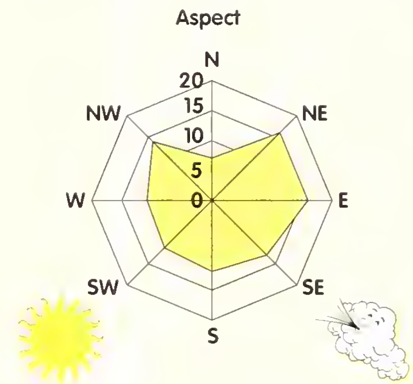
This area is a heavily glaciated shelf of land spanning Skowl Arm and Cholmondeley Sound on eastern Prince of Wales Island. The landscape is one of rounded hills, wetlands, and lakes. Although the surface undulates, the general *terrain* slopes eastward towards Clarence Strait. In the southern half, quartz diorite and diorite bedrock is exposed by heavy glacial scour. In the northern half, glacial *till* deposits effectively mask the underlying sedimentary and volcanic bedrock. Numerous lakes dot a matrix of forested and non-forested wetlands throughout. Soils developing in peat and compact glacial *till* are poorly drained, whereas soils developing on sloping *colluvium* tend to be better-drained. It is on mountain slopes and along stream cutbanks that more productive forests of hemlock and hemlock-spruce occur. High mountains to the west and south protect this area somewhat from major storms; yet, precipitation is moderately high. Common land animals include black bear, Sitka black-tailed deer, wolf, marten (introduced), ermine, river otter, beaver, mink, dusky shrew, northern flying squirrel, Keen's mouse, and long-tailed vole.

Land-Human Interactions. The Kasaan Haida, who migrated north from the Queen Charlotte Islands in the early 1700s, inhabited this area prior the European arrival. The original village of Kasaan (Old Kasaan) was located on the north shore of Skowl Arm prior to its relocation in 1900. Skowl Arm and the southern shores of Kasaan Bay were used heavily for Native subsistence (fish, game, shellfish, berries, seaweed). Former Native villages were located at Sunny Cove and Chasina Point in Cholmondeley Sound. At present, Sealaska Corp. and KAVILCO Inc. manage Native lands around Kasaan Bay and Skowl Bay. Timber harvest and associated roading are recent human activities in this subsection. The waters receive extensive commercial, subsistence, and recreational use. A portion of Old Tom Creek Research Natural Area resides in this subsection. The U.S. Forest Service manages approximately half of the area for development.

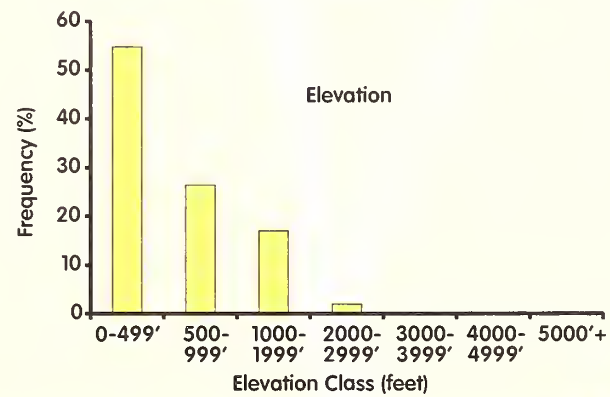




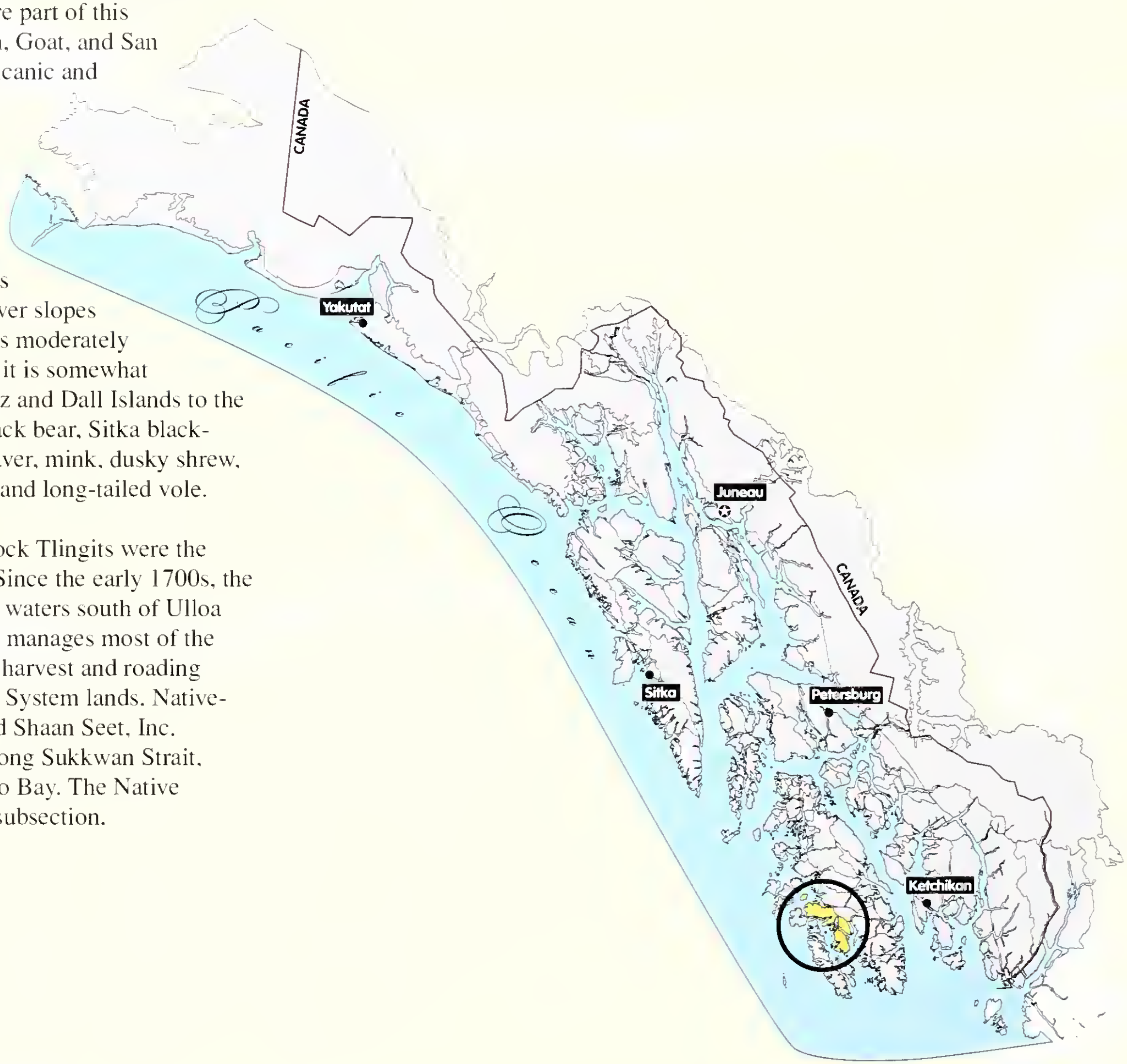
This glacially scoured landscape located along the southeast side of Prince of Wales Island contains large expanses of exposed granitic bedrock. Numerous lakes dot a matrix of forested and nonforested wetlands. The long, glacially carved fjord of McKenzie Inlet is seen in the background.



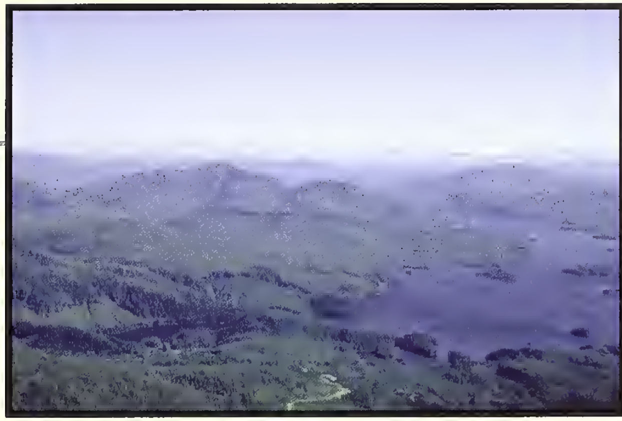
Skowl Arm Till Lowlands	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (75%)	Hills (12%)	Mountain Summits (10%)	Valley Floor (2%)		74
Parent Materials	Colluvium (41%)	Organic Material (25%)	Compact Till (24%)	Residuum (9%)	Alluvial (1%)	64
Soils	Spodosols (62%)	Histosols (35%)	Entisols (1%)	Inceptisols (1%)	Miscellaneous (1%)	74
Landcover	Mixed Conifer (29%)	Brush (25%)	Hemlock (17%)	Lodgepole Pine (11%)	Hemlock-Spruce (6%)	100
Productivity	Nonproductive Forests (46%)	Productive Forests (31%)	Nonforested (23%)			100
Site Index	SI >80 (31%)	SI 41-60 (29%)	SI 61-80 (26%)	SI 0-40 (14%)		99
Wetlands	Upland (46%)	Palustrine Forested (39%)	Palustrine Scrub-Shrub (6%)	Lacustrine Limnetic (3%)	Palustrine Emergent (2%)	100
Stream Process Groups	High Gradient-Contained (60%)	Lake (16%)	Moderate Gradient-Contained (8%)	Moderate Gradient-Mixed Control (5%)	Palustrine (3%)	
Land Use Designations	Intensive Development (45%)	Mostly Natural Setting (29%)	Private (23%)	Moderate Development (2%)		100



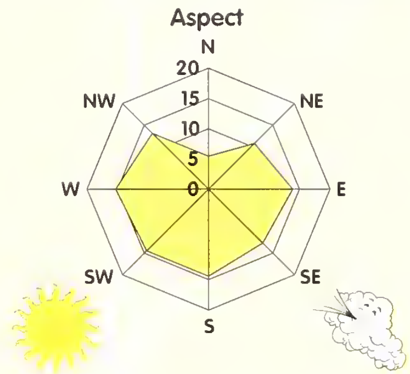
This area consists of glacially rounded hills, broad valleys, and lowlands on the west side of Prince of Wales Island centered on Soda Bay. Islands along Tlevak Strait are part of this subsection; the larger ones are Sukkwan, Goat, and San Juan Bautista Islands. Here, scoured volcanic and sedimentary bedrock underlies poorly drained soils that support a mosaic of forested wetlands and open, shrubby bogs and fens. More productive forests of hemlock and hemlock-spruce occur on better-drained *colluvial* slopes and along incised streams. Productive forests on well-drained glacial *till* drape the lower slopes of Waterfall Peninsula. The area receives moderately high amounts of precipitation, although it is somewhat sheltered from Pacific storms by Suemez and Dall Islands to the west. Common land animals include black bear, Sitka black-tailed deer, wolf, ermine, river otter, beaver, mink, dusky shrew, northern flying squirrel, Keen's mouse, and long-tailed vole.



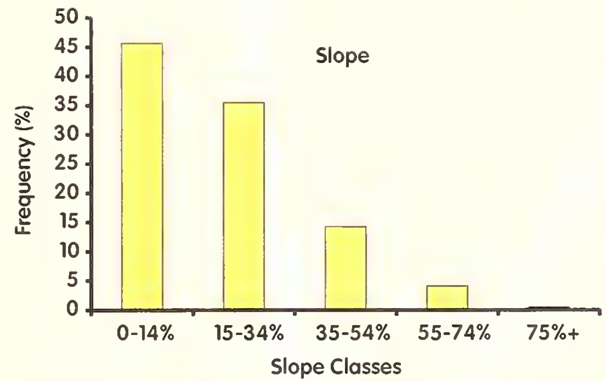
Land-Human Interactions. The Klawock Tlingits were the earliest known inhabitants of this area. Since the early 1700s, the Hydaburg Haidas have resided along its waters south of Ulloa Channel. Today, the U.S. Forest Service manages most of the area for mostly natural settings. Timber harvest and roading have been negligible on National Forest System lands. Native-owned Sealaska Corp., Haida Corp., and Shaan Seet, Inc. actively manage large parcels of land along Sukkwan Strait, Soda Bay, Ulloa Channel, and Trocadero Bay. The Native community of Hydaburg occurs in this subsection.

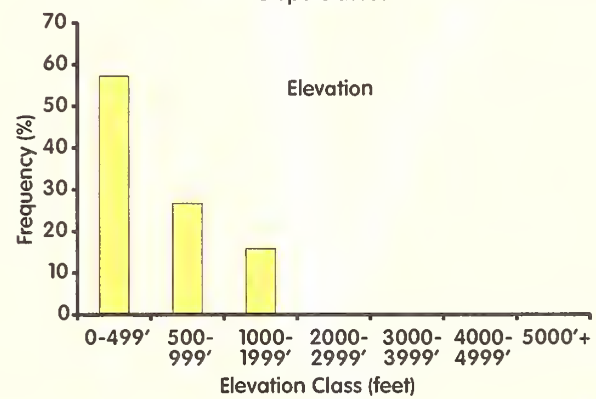


The glacially scoured, rounded hills of the Soda Bay Till Lowlands are seen here at the head of Tracadero Bay on the western shore of central Prince of Wales Island. Glacial deposits underlie the low-productive forested wetlands. The steeper, rounded mountains of the Hetta Inlet Metasediments can be seen in the background.



Soda Bay Till Lowlands	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (69%)	Hills (12%)	Valley Floor (10%)	Coastal (5%)	Mountain Summits (4%)	66
Parent Materials	Colluvium (39%)	Compact Till (28%)	Organic Material (19%)	Residuum (5%)	Marine Beach (5%)	55
Soils	Spodosols (58%)	Histosols (33%)	Inceptisols (7%)	Entisols (2%)		66
Landcover	Brush (25%)	Mixed Conifer (23%)	Hemlock (18%)	Lodgepole Pine (11%)	Hemlock-Spruce (9%)	100
Productivity	Nonproductive Forests (38%)	Productive Forests (31%)	Nonforested (31%)			100
Site Index	SI >80 (43%)	SI 41-60 (25%)	SI 61-80 (22%)	SI 0-40 (10%)		99
Wetlands	Upland (47%)	Palustrine Forested (40%)	Palustrine Emergent (6%)	Palustrine Scrub-Shrub (4%)	Estuarine Intertidal (1%)	100
Stream Process Groups	High Gradient-Contained (59%)	Moderate Gradient-Contained (11%)	Moderate Gradient-Mixed Control (11%)	Floodplain (7%)	Lake (5%)	
Land Use Designations	Mostly Natural Setting (51%)	Private (25%)	Intensive Development (18%)	Moderate Development (5%)		100





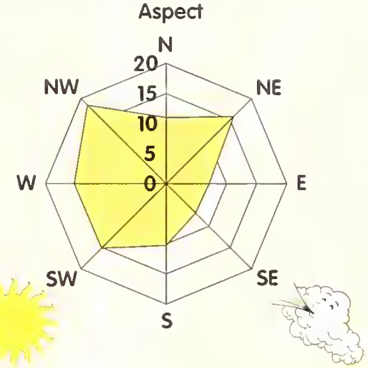
Vixen Inlet Till Lowlands

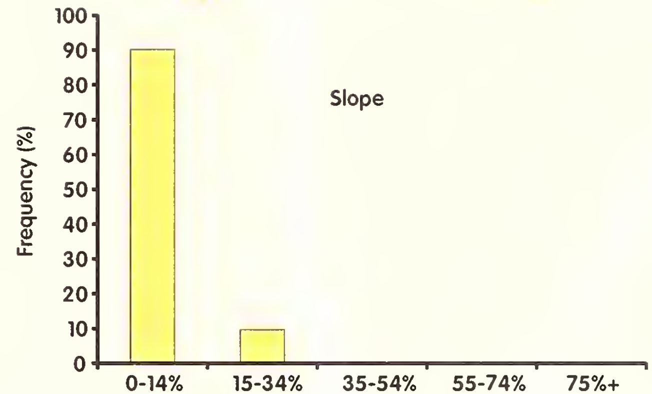
Continental ice sheets scoured a broad saddle-like basin from Spacious Bay to Vixen Inlet and lined it with *till* deposits. The area essentially forms a lowland *isthmus* along Cleveland Peninsula. The smooth topography coupled with compact *till* subsurface has led to saturated soil conditions throughout. The poorly drained organic soils support a mix of forested wetlands and open, shrubby bogs and fens. More productive hemlock forests occupy better-drained slopes and incised streams. *Moderate gradient* and gently sloping *floodplain streams* dominate the smooth *terrain* of unconsolidated sediments. This low-lying area receives only moderate amounts of precipitation due to the lack of *orographic* lifting of moist air. Common lowland mammals include brown and black bear, Sitka black-tailed deer, wolf, porcupine, marten, beaver, ermine, mink, river otter, red and northern flying squirrel, and common and dusky shrew.

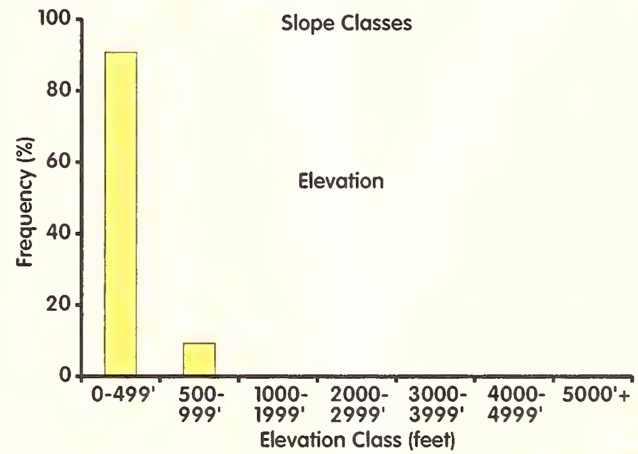
Land-Human Interactions: The Saxman Tlingits originally traversed the eastern half surrounding Spacious Bay, whereas the Stikine Tlingits inhabited the western half around Vixen Inlet. These people used the area for hunting (deer, bear, and seal), fishing (salmon and halibut), and trapping (mink, land otter, beaver, and marten). Today, the U.S. Forest Service manages the entire area in a mostly natural setting. No timber harvests or roads occur within this wetland-rich basin.

A huge expanse of forested and nonforested wetlands has emerged from this glacially scoured terrain. The nearly level landscape forms a swath across Cleveland Peninsula from Vixen Inlet (seen here) northeastwards to Spacious Bay. The compact glacial till underlying this area restricts soil drainage, resulting in a landscape composed of more than 80% wetlands. The peak of Mt. Burnett, part of the Ketchikan Mafics/Ultramafics subsection, appears in the background.

Vixen Inlet Till Lowlands	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (50%)	Valley Floor (33%)	Hills (13%)	Coastal (4%)		98
Parent Materials	Organic Material (35%)	Compact Till (35%)	Alluvial (10%)	Residuum (7%)	Colluvium (6%)	81
Soils	Histosols (46%)	Spodosols (38%)	Entisols (8%)	Inceptisols (8%)		98
Landcover	Hemlock (34%)	Lodgepole Pine (32%)	Mixed Conifer (21%)	Marsh (7%)	Hemlock-Spruce (5%)	100
Productivity	Nonproductive Forests (52%)	Productive Forests (39%)	Nonforested (9%)			100
Site Index	SI 41-60 (39%)	SI 0-40 (30%)	SI >80 (20%)	SI 61-80 (10%)		100
Wetlands	Palustrine Forested (56%)	Palustrine Emergent (22%)	Upland (18%)	Palustrine Scrub-Shrub (3%)	Lacustrine Limnetic (1%)	100
Stream Process Groups	Moderate Gradient-Contained (28%)	High Gradient-Contained (18%)	Moderate Gradient-Mixed Control (17%)	Floodplain (17%)	Low Gradient-Contained (6%)	
Land Use Designations	Mostly Natural Setting (100%)					100







Outwash Plains

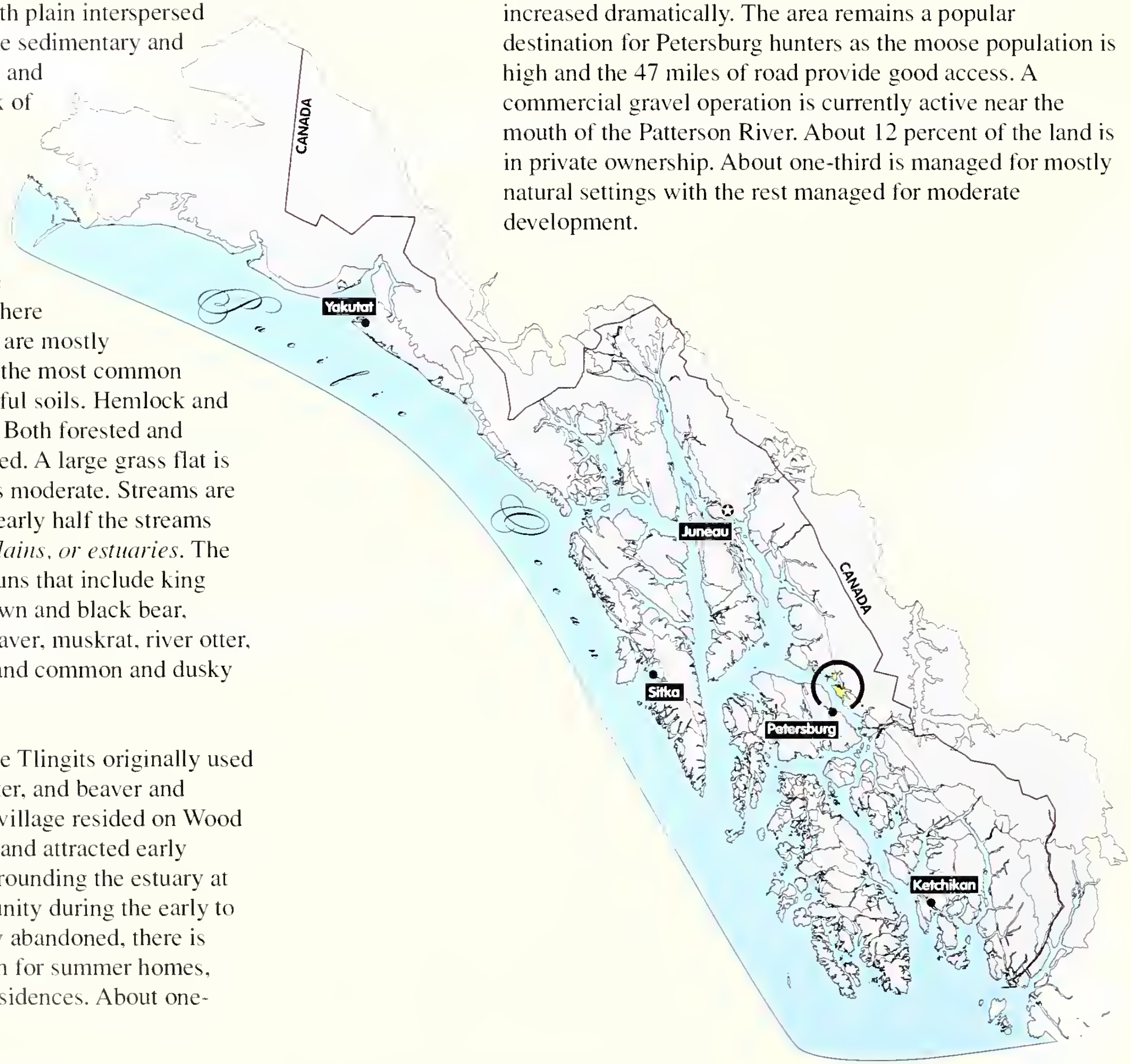
Glaciofluvial processes created these deep *surficial deposits* during glacial retreat. Glacial meltwaters transported huge volumes of sediment, during which inter-granular bonds were removed, particles were reduced in size, rounded, and sorted, and deposited oftentimes in stratified layers (Matthews 1992). Surface layers were often reworked as aggrading streams *braid* and move across these landscapes. Sedimentation generally graded from larger materials (e.g., boulders and cobbles) immediately in front of retreating ice to stratified gravels and sands to fine particles that settled out in stagnant bodies of water. These aggraded landscapes are flat to gently sloping and generally lack distinct landforms unless "pitted" by slow-melting ice blocks.


CANADA
Yakutat
Pacific Ocean
Juneau
CANADA
Sitka
Petersburg
Ketchikan

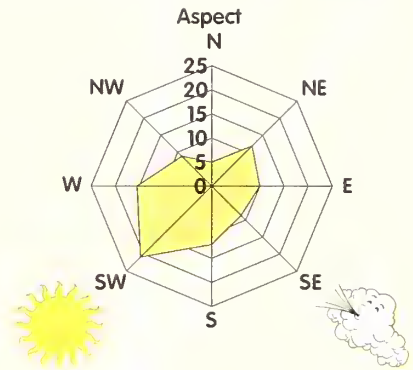
Thomas Bay Outwash Plains

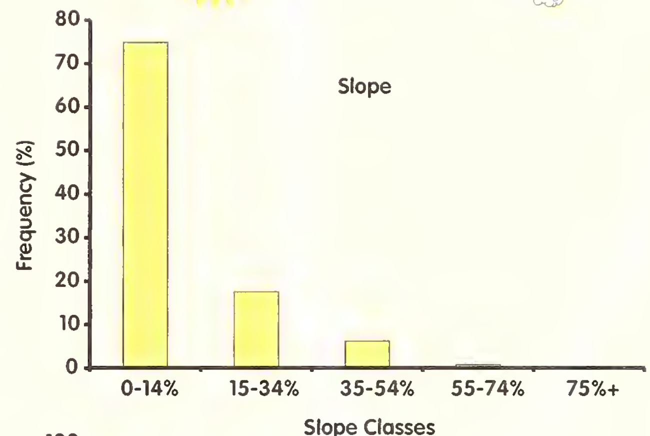
This small mainland subsection encompasses an area of heavy glacial erosion and outwash deposition. *Pleistocene* glaciers reduced the landscape to a mostly smooth plain interspersed with a few rounded hills, remnants of the sedimentary and volcanic rocks that date to the Cenozoic and Permian. The lowlands are mostly a mix of unconsolidated *surficial deposits* left behind as the Patterson and Baird Glaciers retreated. Over 90 percent of the land lies below 500 feet in elevation. The soils that have developed are mostly mineral, but organic soils are present on about one third of the land where subsurface drainage is poor. The forests are mostly productive. Hemlock-spruce forests are the most common landcover, especially on the more youthful soils. Hemlock and mixed conifer forests are also common. Both forested and nonforested wetlands are well represented. A large grass flat is present at Point Agassiz. Precipitation is moderate. Streams are mostly moderate to low gradient with nearly half the streams associated with *glacial outwash, floodplains, or estuaries*. The Muddy River supports several salmon runs that include king salmon. Lowland mammals include brown and black bear, moose, Sitka black-tailed deer, wolf, beaver, muskrat, river otter, mink, red and northern flying squirrel, and common and dusky shrew.

Land-Human Interactions. The Stikine Tlingits originally used this mainland bay for trapping mink, otter, and beaver and hunting bear and seal. A former Native village resided on Wood Point. The gentle relief and productive land attracted early homesteaders and loggers. The area surrounding the estuary at Point Agassiz supported a small community during the early to mid 1900s. Although the town is largely abandoned, there is renewed interest in the area as a location for summer homes, hunting camps, and some year-round residences. About one-third of the productive forest land was harvested, mostly during the 1960s. Following harvest, moose numbers increased dramatically. The area remains a popular destination for Petersburg hunters as the moose population is high and the 47 miles of road provide good access. A commercial gravel operation is currently active near the mouth of the Patterson River. About 12 percent of the land is in private ownership. About one-third is managed for mostly natural settings with the rest managed for moderate development.

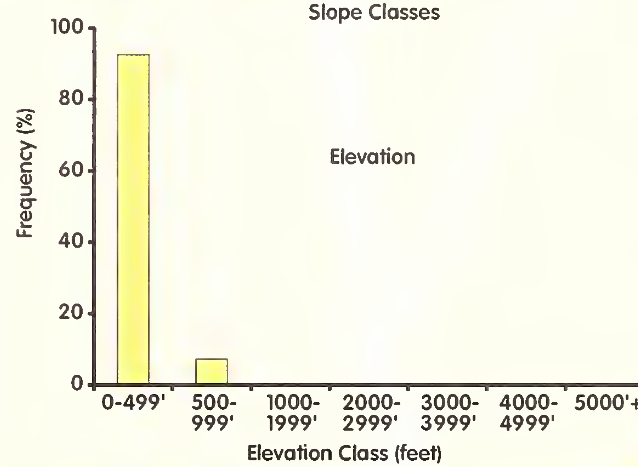


The low gentle relief of outwash plains as it appears on Pt. Agassiz Peninsula between Frederick Sound (foreground) and Thomas Bay (background). The rugged Boundary Ranges Icefields abut the far shores of Thomas Bay. The mouth of the Muddy River is seen in the right foreground. Much of the area is covered by highly productive forests, about a third of which have been logged. Many local residents prize this area for moose hunting.





Thomas Bay Outwash Plains	Ranked Order					% GRID reporting data
	1st	2nd	3rd	4th	5th	
Landforms	Lowlands (44%)	Mountain Slopes (24%)	Valley Floor (20%)	Hills (6%)	Coastal (5%)	95
Parent Materials	Colluvium (20%)	Ablation Till (17%)	Glacial Outwash (15%)	Residuum (15%)	Alluvial (14%)	70
Soils	Spodosols (53%)	Histosols (34%)	Entisols (10%)	Miscellaneous (3%)		95
Landcover	Hemlock-Spruce (25%)	Mixed Conifer (19%)	Brush (18%)	Hemlock (18%)	Lodgepole Pine (11%)	100
Productivity	Productive Forests (45%)	Nonproductive Forests (34%)	Nonforested (21%)			100
Site Index	SI 0-40 (37%)	SI >80 (30%)	SI 41-60 (18%)	SI 61-80 (15%)		100
Wetlands	Upland (52%)	Palustrine Forested (27%)	Palustrine Emergent (12%)	Riverine (2%)	Lacustrine Limnetic (2%)	100
Stream Process Groups	High Gradient-Contained (23%)	Glacial Outwash (21%)	Moderate Gradient-Mixed Control (13%)	Estuary (12%)	Floodplain (11%)	
Land Use Designations	Moderate Development (63%)	Mostly Natural Setting (24%)	Private (12%)			100



Glaciomarine Terraces

Large amounts of sediment were washed from the land to the sea during the retreat of contintenal ice sheets. During meltwater transit, sediments were naturally sorted according to their particle size from boulders and cobbles through gravels and coarse-grained sands to fine-grained sands and silts. Unless immediately adjacent to retreating ice, most sediments flushed to sea were glacially pulverized, fine-texture particles ("rock-flour"). These fine sediments flocculated in deep water and deposited on the sea floor with a sprinkling of larger iceberg-rafted rocks (Miller 1973). Some of these deposits eventually surfaced through *tectonic* and glacial (*isostatic rebound*) processes and worldwide sea level changes. Today, *glaciomarine* deposits ring many coastlines up to 700 feet above sea level at certain locations (Conner and O'Haire 1988; T. Brock, pers. observ.)! Although *glaciomarine* deposits occur throughout portions of the Inside Passage, the most extensive and well-known deposit occurs near Juneau as part of the Gastineau Formation (Miller 1973). These surfaces collect much water and are wetland-dominated because of their low permeability, gentle topography, and low-lying position on the landscape.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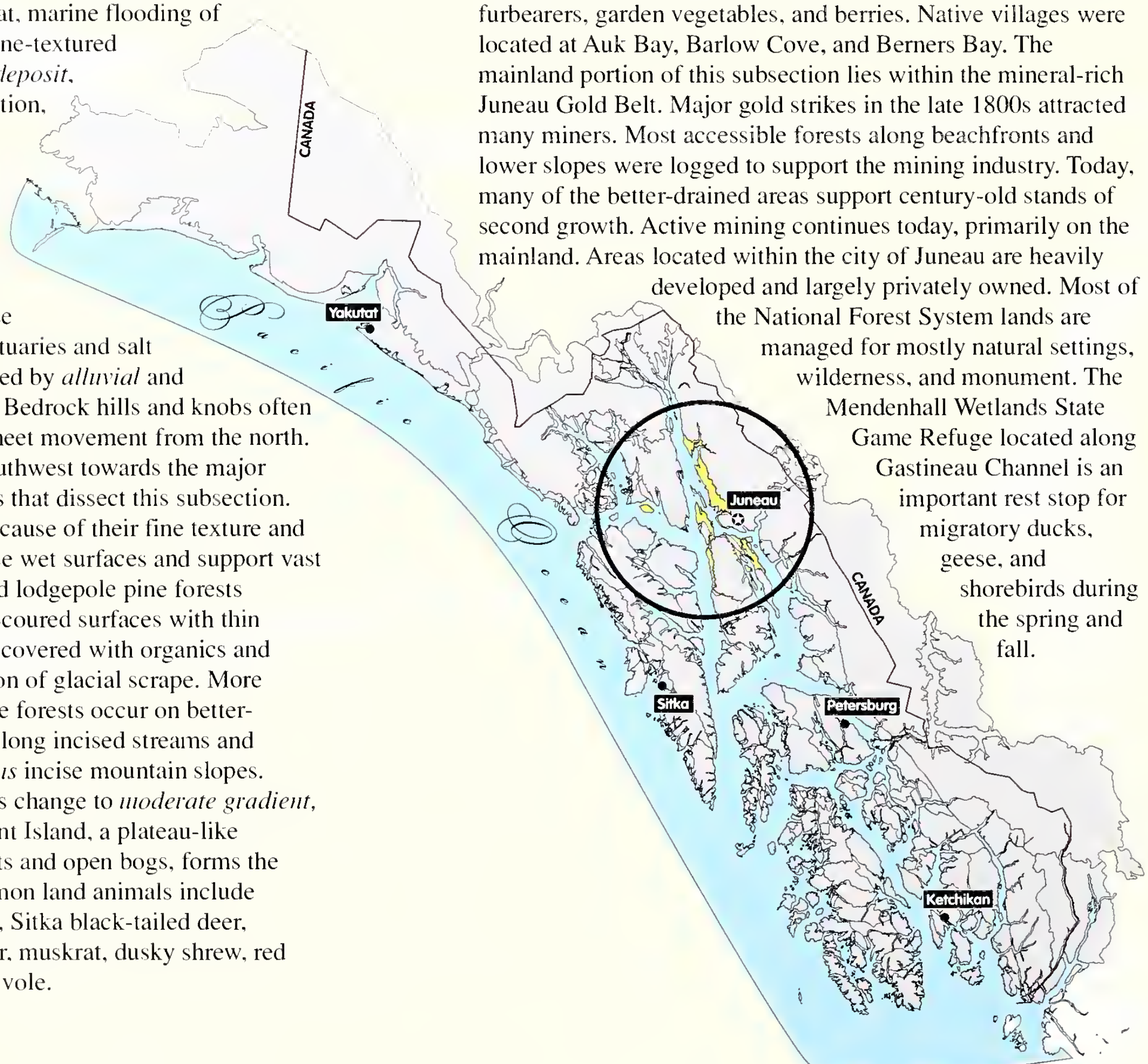
Stephens Passage Glaciomarine Terraces

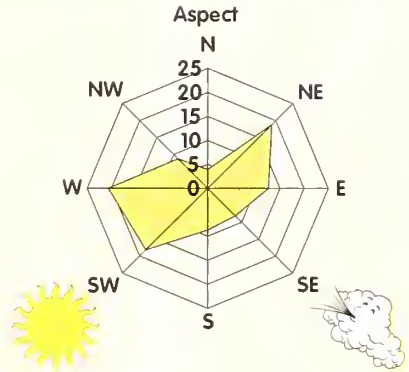
Massive continental glaciers descended through Lynn Canal, Icy Strait, Chatham Strait, and Stephens Passage, severely eroding adjacent surfaces along the way. After their retreat, marine flooding of low-lying areas covered surfaces with fine-textured *glaciomarine* sediments. This *surficial deposit*, known as the Gastineau Channel Formation, consists of a fine-grained matrix of silt and sand containing pebbles and occasional larger *dropstones* (Miller 1973). Tectonics and isostatic rebound have since raised these surfaces out of the sea, forming terraces that grade into scoured hills and mountain slopes. These *glaciomarine* terraces are rimmed by estuaries and salt marshes along the coast and are blanketed by *alluvial* and *colluvial* deposits along mountainsides. Bedrock hills and knobs often have elliptical shapes that parallel ice sheet movement from the north. Much of the area slopes northeast or southwest towards the major northwest-southeast trending waterways that dissect this subsection. Most surfaces have low permeability because of their fine texture and gentle slope. Organic soils underlie these wet surfaces and support vast wetland complexes of mixed conifer and lodgepole pine forests interspersed with open, shrubby bogs. Scoured surfaces with thin *glaciomarine* and *till* deposits are often covered with organics and possess wetlands oriented in the direction of glacial scrape. More productive hemlock and hemlock-spruce forests occur on better-drained mountain slopes, hilltops, and along incised streams and beachfronts. Swift, *high gradient streams* incise mountain slopes. Upon reaching terraces, stream channels change to *moderate gradient, floodplain, and palustrine types*. Pleasant Island, a plateau-like volcanic knob laden with wetland forests and open bogs, forms the western extent of this subsection. Common land animals include brown bear, black bear (mainland only), Sitka black-tailed deer, marten, ermine, mink, beaver, river otter, muskrat, dusky shrew, red squirrel, Keen's mouse, and long-tailed vole.

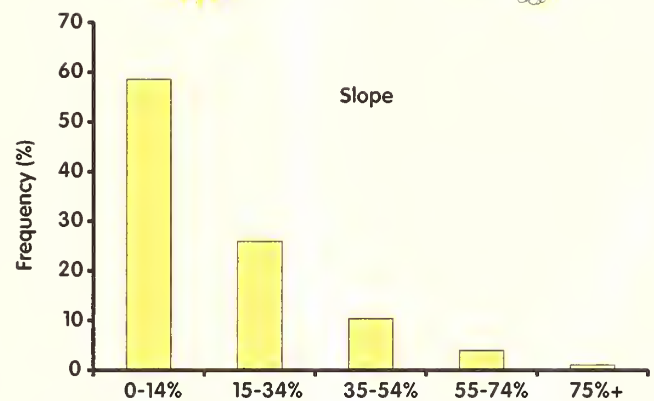


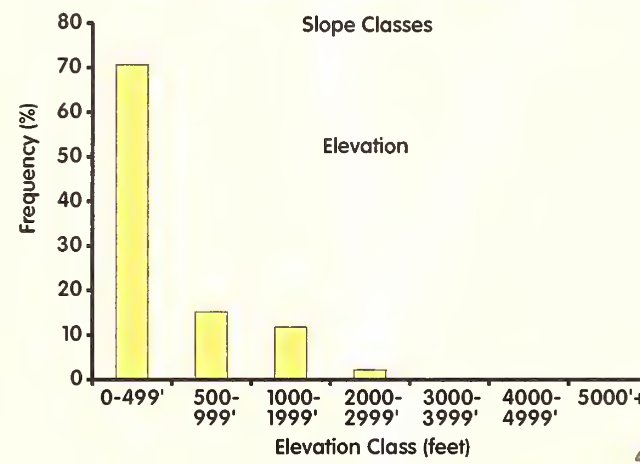
Land-Human Interactions. This area was the homeland of the Auk Tlingit, who subsisted on salmon, halibut, game, shellfish, furbearers, garden vegetables, and berries. Native villages were located at Auk Bay, Barlow Cove, and Berners Bay. The mainland portion of this subsection lies within the mineral-rich Juneau Gold Belt. Major gold strikes in the late 1800s attracted many miners. Most accessible forests along beachfronts and lower slopes were logged to support the mining industry. Today, many of the better-drained areas support century-old stands of second growth. Active mining continues today, primarily on the mainland. Areas located within the city of Juneau are heavily developed and largely privately owned. Most of the National Forest System lands are managed for mostly natural settings, wilderness, and monument. The Mendenhall Wetlands State Game Refuge located along Gastineau Channel is an important rest stop for migratory ducks, geese, and shorebirds during the spring and fall.

A view of Mansfield Peninsula looking northward up Lynn Canal. Barlow Island is on the right and Lincoln Island is in the distance. The relatively flat topography, low productive forests, and nonforested wetlands aptly characterize this subsection.

Stephens Passage Glaciomarine Terraces	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mtn Slopes (34%)	Lowlands (23%)	Hills (21%)	Valley Floor (13%)	Mtn Summits (8%)	56
Parent Materials	Colluvium (38%)	Organic Material (28%)	Compact Till (10%)	Bedrock (9%)	Alluvial (6%)	53
Soils	Histosols (45%)	Spodosols (44%)	Inceptisols (7%)	Entisols (4%)	Miscellaneous (1%)	53
Landcover	Hemlock (35%)	Hemlock-Spruce (23%)	Mixed Conifer (15%)	Lodgepole Pine (13%)	Brush (5%)	100
Productivity	Productive Forests (61%)	Nonproductive Forests (32%)	Nonforested (8%)			100
Site Index	SI 0-40 (35%)	SI 41-60 (30%)	SI 61-80 (21%)	SI >80 (14%)		68
Wetlands	Upland (65%)	Palustrine Forested (19%)	Palustrine Emergent (7%)	Palustrine Scrub-Shrub (6%)	Estuarine Intertidal (1%)	100
Stream Process Groups	High Gradient-Contained (30%)	Floodplain (23%)	Moderate Gradient-Contained (12%)	Palustrine (11%)	Moderate Gradient-Mixed Control (7%)	
Land Use Designations	Mostly Natural Setting (38%)	Wilderness & Mounument (36%)	Private (16%)	Moderate Develop-ment (10%)		100







Wave-cut Terraces

There have been numerous times during the Quaternary when the sea level has been higher or lower relative to the present. In Alaska, these fluctuations are primarily due to *tectonic-* and glacial-induced land movements coupled with changes in worldwide sea levels (Plafker 1990). Wave-cut terraces, or old shore platforms, formed during marine transgressions when the relative sea level was higher than the present. Wave energy, orientation of the coast, frequency of storm surges, and other factors control the rate by which these platforms form (Chorley et al. 1984). Wave-cut terraces are quite extensive along flat areas of coastal Alaska, especially in *surficial deposits* along the North Slope, Seward Peninsula, and southwestern Alaska (Pewe 1975, Plafker 1990). In Southeast Alaska, where steep, bedrock-controlled *terrain* prevails, marine transgressions are often recorded as narrow bands or concentric rings around rocky coastlines of the islands. Most wave-cut terraces cover small areas throughout Southeast Alaska, except for one extensive collection along the outer coasts of Chichagof and Baranof Islands.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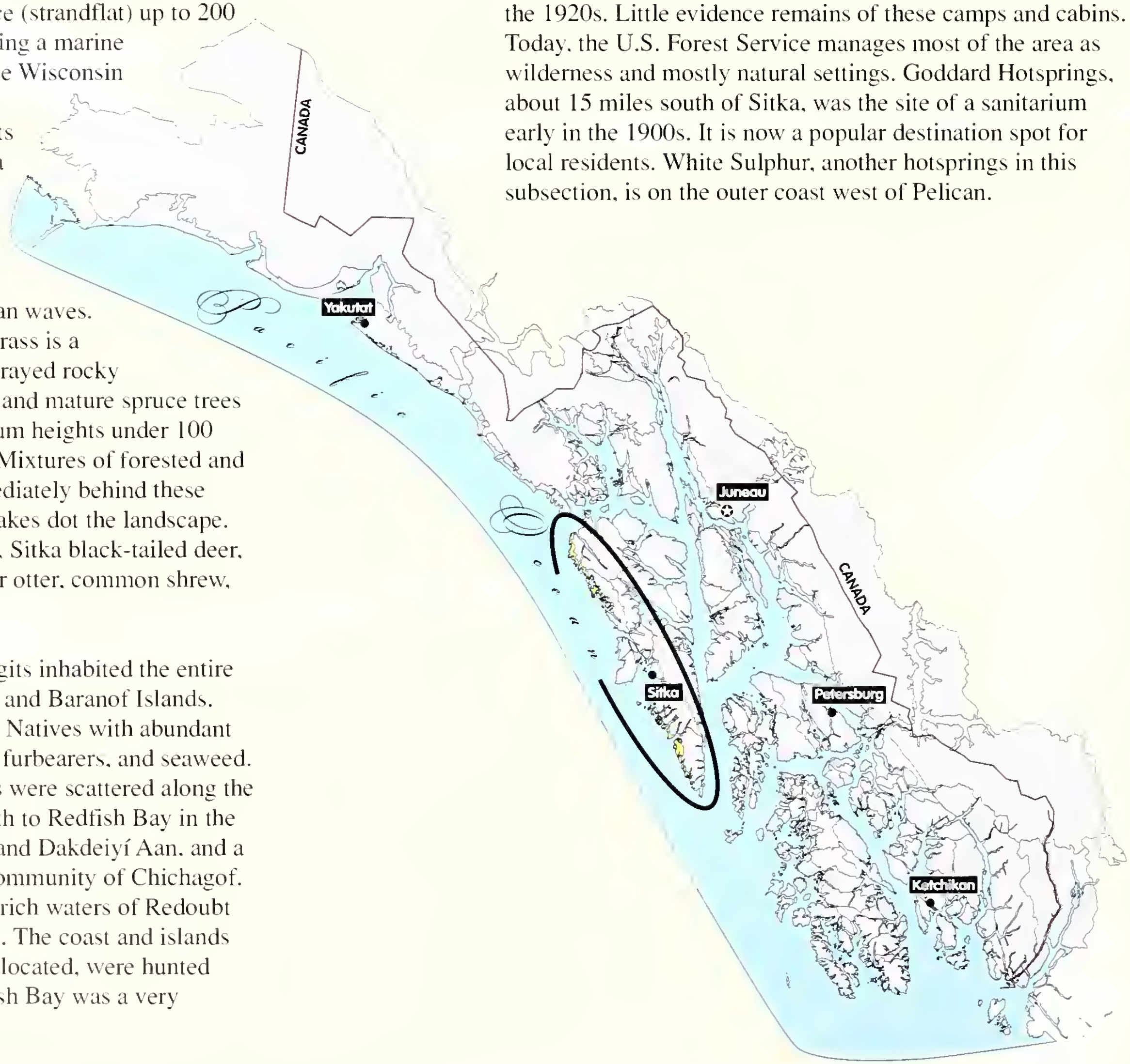
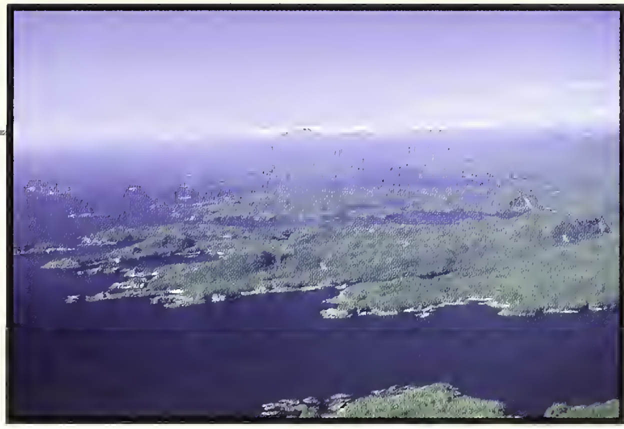
Outer Coast Wave-cut Terraces

A narrow band of coastline with thousands of islands lines the western edge of Chichagof and Baranof Islands. This coastal area represents a former wave-cut terrace (strandflat) up to 200 ft above current sea level. It formed during a marine transgression when the weight of the late Wisconsin glaciers still depressed this area (Mann 1986). It is a striking series of seamounts and shelves that currently rise above sea level. *Moderate and high gradient streams* are controlled largely by bedrock. Soils are primarily derived from bedrock, since most of the *till* and other materials were washed off by ocean waves. Vegetation is varied. Sitka spruce-reedgrass is a common plant community along salt-sprayed rocky coastlines. Here, shrubs are uncommon and mature spruce trees are somewhat stunted, reaching maximum heights under 100 feet (short by Sitka spruce standards!). Mixtures of forested and nonforested wetlands often reside immediately behind these beachfront forests. Numerous shallow lakes dot the landscape. Common mammals include brown bear, Sitka black-tailed deer, marten (introduced), ermine, mink, river otter, common shrew, Keen's mouse, and tundra vole.

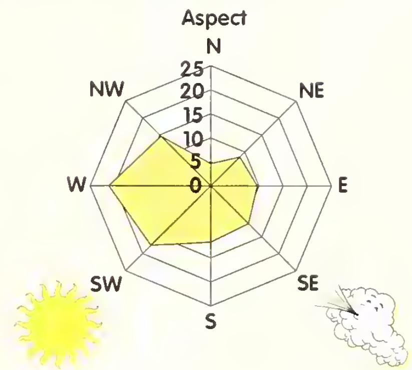


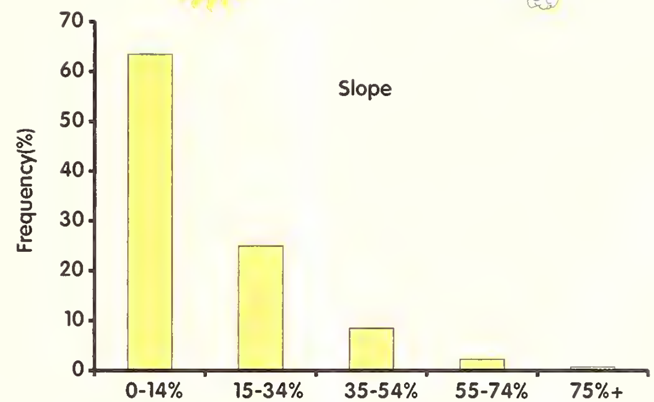
Land-Human Interactions. Sitka Tlingits inhabited the entire stretch of ocean coastline on Chichagof and Baranof Islands. The rich marine environment supported Natives with abundant salmon, halibut, herring, seal, shellfish, furbearers, and seaweed. Numerous smokehouses and fish camps were scattered along the jagged coast from Surge Bay in the north to Redfish Bay in the south. Two Native villages, Gagaxlean and Dakdeiyí Aan, and a fort at Klag Bay preceded the mining community of Chichagof. Two Native forts protected the seafood-rich waters of Redoubt Bay and the village of Kasdaxeixda.aan. The coast and islands around Goddard, where hot springs are located, were hunted extensively for seal and sea otter. Redfish Bay was a very important subsistence area and guarded by a Native fort. Fox farming was tried throughout many of the coastal islands in the 1920s. Little evidence remains of these camps and cabins. Today, the U.S. Forest Service manages most of the area as wilderness and mostly natural settings. Goddard Hotsprings, about 15 miles south of Sitka, was the site of a sanitarium early in the 1900s. It is now a popular destination spot for local residents. White Sulphur, another hotsprings in this subsection, is on the outer coast west of Pelican.

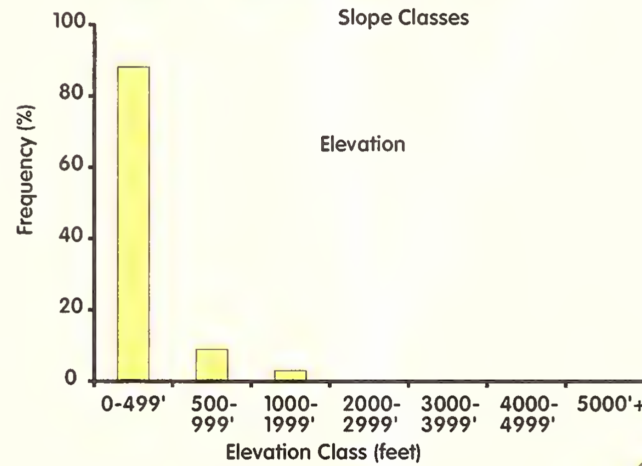


A view looking north-northwest over Walker Channel and the Rakof Islands (Crawfish Inlet) on the west coast of Baranof Island. Low productivity western hemlock-yellow cedar forests dominate this landscape. Note the storm-pounded rocks bare of vegetation on the exposed points. This area is also quite prone to landslides, as evident from the linear scars in the middle ground of Beauchamp and Lodge Islands.

Outer Coast Wave-cut Terraces	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Hills (66%)	Lowlands (16%)	Mountain Slopes (8%)	Coastal (8%)	Valley Floor (2%)	22
Parent Materials	Organic Material (62%)	Colluvium (13%)	Volcanic Ejecta (10%)	Glacial Till (9%)	Residuum (3%)	18
Soils	Histosols (70%)	Spodosols (20%)	Inceptisols (9%)			18
Landcover	Mixed Conifer (29%)	Lodgepole Pine (21%)	Hemlock-Spruce (15%)	Hemlock (15%)	Brush (9%)	100
Productivity	Nonproductive Forests (51%)	Productive Forests (32%)	Nonforested (17%)			100
Site Index	SI 0-40 (68%)	SI 41-60 (26%)	SI 61-80 (5%)	SI >80 (1%)		57
Wetlands	Upland (41%)	Palustrine Forested (25%)	Palustrine Emergent (20%)	Palustrine Scrub-Shrub (6%)	Lacustrine Limnetic (3%)	53
Stream Process Groups	Moderate Gradient-Contained (31%)	High Gradient-Contained (26%)	Lake (23%)	Palustrine (6%)	Estuary (4%)	
Land Use Designations	Wilderness & Monument (74%)	Mostly Natural Setting (22%)	Private (4%)			100







Post-glacial Terrains

These youthful surfaces reflect deposits and events since deglaciation that are not affiliated with active glacial processes. Most such deposits are too small in scale to be individually recognized. Of these deposits, including *alluvial* and *colluvial* fans, landslides, and recent volcanic deposits and *pyroclastic* flows, only the latter volcanics are mappable at a subsection scale.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Volcanics

These Holocene volcanic surfaces consist of extrusive igneous rocks including basalts, andesites, volcanogenic conglomerates and *breccias*, and *pyroclastic* rocks. Rock type may control drainage (e.g., internally drained cinder deposits, cinder cones, and lava flows) as well as slope. A mixture of forest types exists across the area as a function of drainage, aspect, and elevation. Mount Edgecumbe Volcanic Field released massive amounts of ash 12-14,000 years ago just after the Cordillerian ice sheet retreated. The Princess Bay Volcanic Field was active soon after deglaciation to possibly 2,000 years ago. *Felsic* volcanic parent materials are often quite acidic, which promotes wetland development. Cinder cone deposits develop distinctive radial stream patterns.


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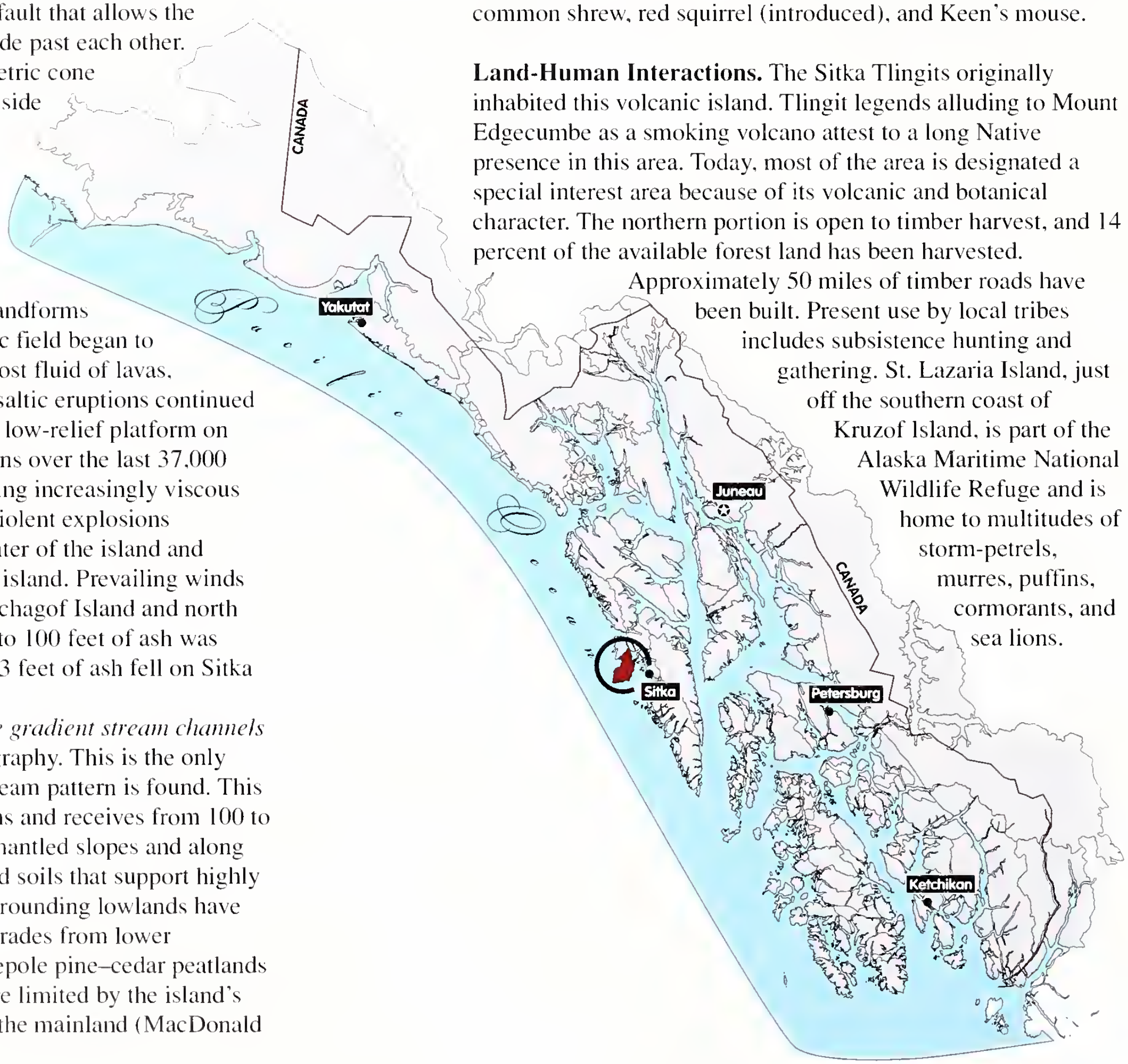
Mount Edgecumbe Volcanics

On the southern portion of Kruzof Island lies a striking landscape of *scoria cones* and lava fields. This relatively rare type of volcanic field occurs along a transform fault that allows the Pacific and North American plates to slide past each other. Mount Edgecumbe, a beautifully symmetric cone rising to 3,200 feet on the southwestern side of the island, is its most impressive landmark. Smaller *scoria cones* aligned to the northeast of Mount Edgecumbe effectively bisect the island along its center. The changes of lava viscosity (stiffness) during the volcanic eruption sequence help explain the present-day landforms of the island (Riehle 1996). The volcanic field began to form 600,000 years ago as basalt, the most fluid of lavas, welled through cracks on the island. Basaltic eruptions continued for 500,000 years, essentially forming a low-relief platform on which later flows lie. Sequential eruptions over the last 37,000 years have built volcanic cones by ejecting increasingly viscous lavas of andesite, dacite, and rhyolite. Violent explosions generated *pyroclastic* flows over the center of the island and spread pumice and ash across the entire island. Prevailing winds blew sizeable quantities of ash onto Chichagof Island and north Baranof Island (Riehle et al. 1992). Up to 100 feet of ash was deposited near the vents, whereas up to 3 feet of ash fell on Sitka 15 miles to the east.

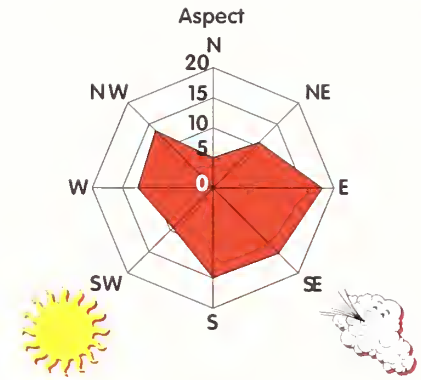
A radial pattern of *high and moderate gradient stream channels* occurs consistent with the conical topography. This is the only place in Southeast Alaska where this stream pattern is found. This island is exposed to strong Pacific storms and receives from 100 to 200 inches of precipitation. On cinder-mantled slopes and along deeply incised streams are better-drained soils that support highly productive, hemlock-spruce forests. Surrounding lowlands have wet organic soils and forest cover that grades from lower productive hemlock-cedar to open lodgepole pine–cedar peatlands on wide *interfluves*. Mammal species are limited by the island's geographic isolation and distance from the mainland (MacDonald and Cook 1996). Common mammals include brown bear, Sitka black-tailed deer, marten (introduced), ermine, mink, river otter, common shrew, red squirrel (introduced), and Keen's mouse.

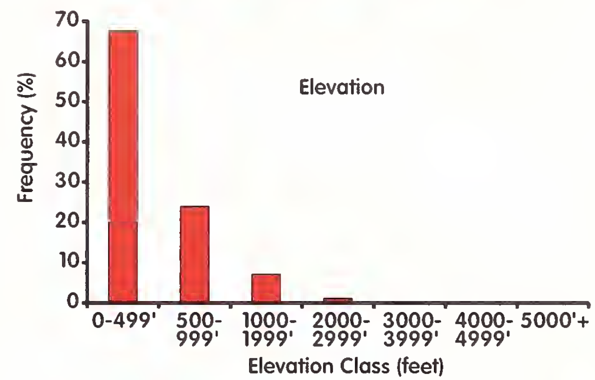


Land-Human Interactions. The Sitka Tlingits originally inhabited this volcanic island. Tlingit legends alluding to Mount Edgecumbe as a smoking volcano attest to a long Native presence in this area. Today, most of the area is designated a special interest area because of its volcanic and botanical character. The northern portion is open to timber harvest, and 14 percent of the available forest land has been harvested. Approximately 50 miles of timber roads have been built. Present use by local tribes includes subsistence hunting and gathering. St. Lazaria Island, just off the southern coast of Kruzof Island, is part of the Alaska Maritime National Wildlife Refuge and is home to multitudes of storm-petrels, murres, puffins, cormorants, and sea lions.

The symmetrical cone of Mount Edgecumbe viewed from the south. Saint Lazaria Island (foreground) is a well-known sea bird rookery comprised of massive andesite. The recent die-off of yellow cedar is evident as grayer forested patches where snags are very common.

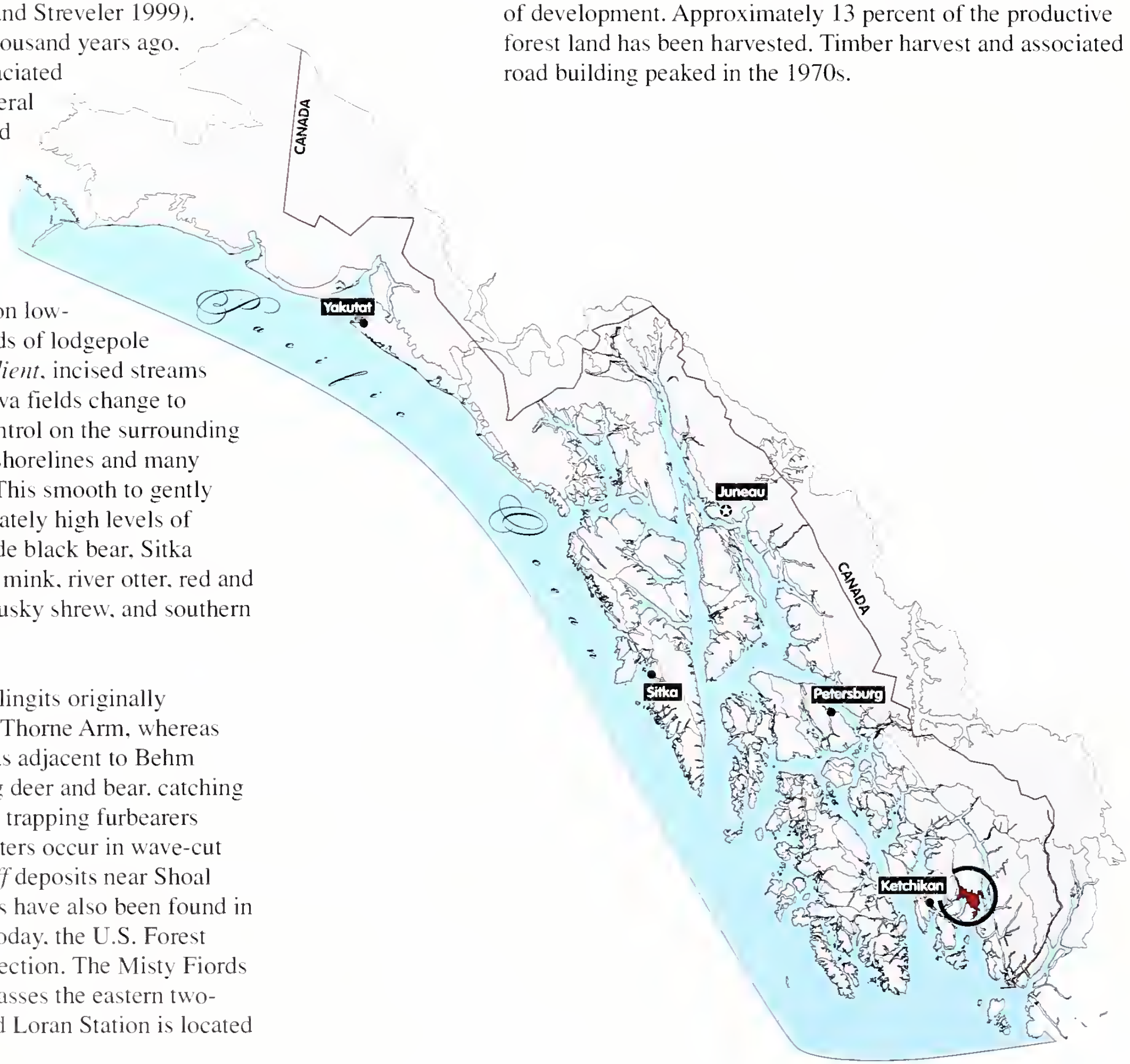
Mount Edgecumbe Volcanics	Ranked Order					% GRID reporting data
	1st	2nd	3rd	4th	5th	
Landforms	Volcanic (79%)	Mountain Slopes (11%)	Lowlands (5%)	Coastal (4%)	Hills (1%)	99
Parent Materials	Volcanic Ejecta (53%)	Organic Material (25%)	Colluvium (12%)	Alluvial (5%)	Residuum (4%)	20
Soils	Spodosols (59%)	Histosols (25%)	Inceptisols (14%)	Entisols (2%)		20
Landcover	Hemlock-Spruce (31%)	Mixed Conifer (19%)	Marsh (18%)	Lodgepole Pine (11%)	Alder (7%)	100
Productivity	Nonproductive Forests (39%)	Productive Forests (38%)	Nonforested (22%)			100
Site Index	SI 0-40 (45%)	SI 41-60 (26%)	SI 61-80 (22%)	SI >80 (6%)		100
Wetlands	Palustrine Forested (37%)	Upland (35%)	Palustrine Scrub-Shrub (17%)	Palustrine Emergent (11%)		100
Stream Process Groups	High Gradient-Contained (49%)	Moderate Gradient-Contained (30%)	Floodplain (14%)	Low Gradient-Contained (3%)	Estuary (2%)	
Land Use Designations	Mostly Natural Setting (75%)	Moderate Development (21%)	Intensive Development (3%)			100





Princess Bay Volcanics

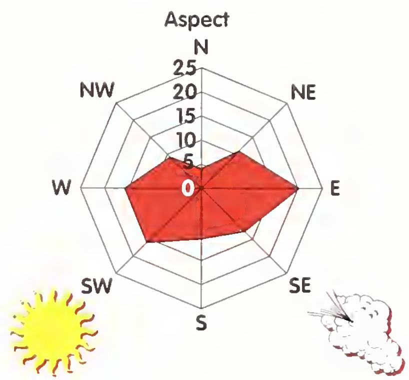
This volcanic landscape of basaltic flows and cinder cones occurs along the southern portion of Revillagigedo Island from Princess Bay to Carroll Inlet (Baichtal and Streveler 1999). Recent volcanic activity, only several thousand years ago, spewed rocks and ash onto a heavily glaciated surface. Most of the area possesses mineral soils that formed in *residuum* (weathered rock in place) or *colluvium*. The tops of some large *scoria cones* are devoid of vegetation. Productive hemlock and hemlock-spruce forests drape the volcanic slopes and ash fields. Poorly drained organic soils occur principally on low-lying areas and support forested wetlands of lodgepole pine and open bogs and fens. *High gradient*, incised streams coursing down cinder cones and over lava fields change to *moderate gradient streams* of mixed control on the surrounding lowlands. Large lakes with convoluted shorelines and many islets are distinctive to this subsection. This smooth to gently sloping volcanic *terrain* receives moderately high levels of precipitation. Common mammals include black bear, Sitka black-tailed deer, wolf, marten, ermine, mink, river otter, red and northern flying squirrel, common and dusky shrew, and southern red-backed and long-tailed vole.

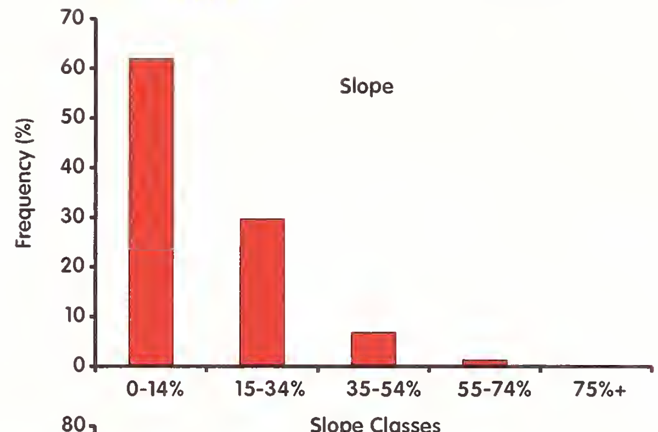


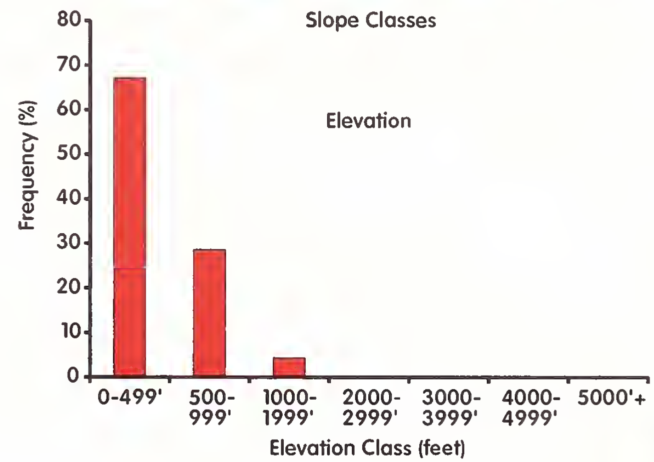
Land-Human Interactions. Tongass Tlingits originally inhabited the lands by Carroll Inlet and Thorne Arm, whereas the Saxman Tlingits frequented the areas adjacent to Behm Canal. Natives used the area for hunting deer and bear, catching and drying salmon, picking berries, and trapping furbearers (mink, beaver, otter, marten). Rock shelters occur in wave-cut alcoves eroded into volcanic ash and *tuff* deposits near Shoal Cove (J. Baichtal, pers. obvers.). Burials have also been found in gas pockets within volcanic *breccias*. Today, the U.S. Forest Service manages all of this unique subsection. The Misty Fiords Natural Monument Wilderness encompasses the eastern two-thirds of the area. The U.S. Coast Guard Loran Station is located on the ash flows southwest of a vent named Painted Peak near Shoal Cove. Much of the remainder allows some form of development. Approximately 13 percent of the productive forest land has been harvested. Timber harvest and associated road building peaked in the 1970s.

A northeast view of the lava field surrounding Princess Bay (center). This area extends westward to Carroll Inlet on Revillagigedo Island. Here, volcanic rocks and ash were recently deposited on a heavily glaciated land surface. Some small lakes with convoluted shorelines in the center of this photo have been created from volcanic flows.

Princess Bay Volcanics	Ranked Order 1st	2nd	3rd	4th	5th	% GRID reporting data
Landforms	Mountain Slopes (69%)	Valley Floor (22%)	Hills (8%)			37
Parent Materials	Colluvium (57%)	Residuum (28%)	Organic Material (15%)	Alluvial (1%)		28
Soils	Spodosols (62%)	Histosols (34%)	Inceptisols (3%)			37
Landcover	Hemlock (42%)	Lodgepole Pine (31%)	Hemlock-Spruce (11%)	Mixed Conifer (6%)	Brush (5%)	100
Productivity	Productive Forests (57%)	Nonproductive Forests (37%)	Nonforested (6%)			100
Site Index	SI 0-40 (62%)	SI >80 (20%)	SI 41-60 (10%)	SI 61-80 (9%)		100
Wetlands	Palustrine Forested (60%)	Upland (26%)	Palustrine Emergent (6%)	Lacustrine Limnetic (4%)	Palustrine Scrub-Shrub (2%)	100
Stream Process Groups	High Gradient-Contained (37%)	Palustrine (14%)	Moderate Gradient-Contained (13%)	Moderate Gradient-Mixed Control (12%)	Lake (12%)	
Land Use Designations	Wilderness & Monument (62%)	Intensive Development (20%)	Moderate Development (10%)	Mostly Natural Setting (8%)		100







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Glossary of Terms

Terms were defined using the following resources: Allaby 1998, Glossary Review Committee 1960, Fairbridge 1968, Matthews 1992, Cowardin et al. 1979, Paustian 1992, Barnhart and Barnhart 1990, MacDonald and Cook 1996, Woolf 1977, Baichtal and Streveler 1999, USDA Forest Service 1997, and Plummer and McGeary 1985.

Ablation till: Glacial deposits left by the slow, *in situ* melting of debris-rich glaciers at high altitude. These melt-out deposits consist of coarse-textured debris within and on top of glaciers (englacial and supraglacial debris, respectively) and may overlie tills that formed first beneath glaciers (subglacial tills).

Abiotic: Having no life; applied to the non-living components of the environment such as bedrock, soil, water, solar radiation, etc.

Abrasion: The process whereby bedrock is scored by debris carried in the basal layers of a glacier.

Accretion (accreted): The accumulation of sediments from any cause, representing an excess of deposition over erosion. The addition of material to the edge of a continent, thus enlarging it.

Aeolian: Wind-transported sediment. See loess.

Allochthonous: Not indigenous; acquired. Applied to material that did not originate in its present position.

Alluvial fan process group (channel types or streams): A collection of low to moderate gradient (<5%) stream channels that are strongly influenced by alluvial sediment deposition and normally located on mountain footslopes.

Alluvium (alluvial): Applied to the environments, processes, and products of rivers or streams. Alluvial deposits are formed through sediment transfer by surface runoff.

Anadromous: Applied to the migratory behavior of fish that spend most of their lives in sea, but then migrate to freshwater to spawn.

Anaerobic: An environment where oxygen is lacking or absent.

Archipelago: A group of islands; a sea containing many scattered small islands.

Arête: A knife-edged, steep-sided ridge found in upland areas that have been or are being glaciated.

Base cations: Positively-changed ions, including calcium, magnesium, sodium, and potassium, that occur in the soil solution or held on the surface of colloids of clay and humus.

Batholith: A large, shield-shaped body of intrusive, igneous rock exposed by the removal of its rock cover.

Bedload: Rocks, sediment, and other debris rolled along the bottom of a stream by the moving water.

Biotic: Having to do with living things; applied to the living components of the environment.

Braided stream (braided channel, braided river): A stream that consists of a number of small channels separated by sand and gravel bars.

Breccia: A rock made up of highly angular coarse fragments.

Chronosequence: A sequence of related vegetation and/or soils that differ in their degree of development because of differences in their age.

Cirque: A steep-sided, amphitheater-like hollow carved into a mountain at the head of a glacial valley.

Colluvium (colluvial): Weathered rock debris that has moved down a slope by the force of gravity.

Deformation (deformed): Any change in the original form or volume of rock masses produced by *tectonic* forces; folding, faulting, and solid flow are common modes of deformation.

Delta (deltaic): An alluvial deposit, usually triangular or fan-shaped, at the mouth of a river. A deposit of sediment formed where a sediment-laden current enters an open body of water.

Distal: Applied to a depositional environment sited at the furthest position from the source area, and generally characterized by fine-grained sediments.

Doline (or sinkhole): A relatively shallow, bowl- or funnel-shaped depression ranging in diameter from a few feet to more than 3,000 feet. The dissolution and subsequent settlement of bedrock often form these depressions or collapse features.

Dropstones: Stones and rocks shed by melting ice sheets or icebergs through a column of water. These rocks are often found intermixed with finer-textured *glaciolacustrine* or *glaciomarine* deposits.

Drumlin: A smooth, oval-shaped landform resulting from glacial override that deposits unconsolidated materials on the leeside of surface protrusions and streamlines them. Normally occurring in large groups (drumlin fields), the long axis of a drumlin lies parallel to the direction of glacial advance.

Endemism: Belonging or native to a particular place; restricted or peculiar to a locality or region.

Entisols: An order of embryonic mineral soils that have only the initiation of soil profile development. Entisols are common on recent floodplains, steep eroding slopes, sand dunes, and recent deep ash or wind deposits.

Epikarst: The surface of karst. It is an intensely dissolved veneer consisting of an intricate network of intersecting dissolution-widened fissures, cavities, and tubes. It is this network of intersecting fissures which collect and transport surface waters and nutrients vertically to the underlying karst conduits.

Ericaceous shrubs: Low- to moderate-growing shrubs in or closely related to the heath family (*Ericaceae*).

Estuarine intertidal: Coastal wetlands where the substrate is exposed and flooded by tides; includes the associated splash zone [National Wetland Inventory].

Estuarine process group (channel types or streams): A collection of all intertidal streams that are directly influenced by saltwater tidal inundation.

Estuarine subtidal: Deepwater tidal habitats where the substrate is continuously submerged and ocean water is at least occasionally diluted by freshwater runoff from the land [National Wetland Inventory].

Estuary: A coastal body of water where freshwater, derived from land, mixes with seawater. Estuaries are often subject to tidal action.

Evapotranspiration: A combined term for water lost as vapor from soil or open water (evaporation) and water lost from the surface of a plant, mainly via leaf pores (transpiration).

Evolution: Change with continuity in successive generations of organisms; descent with modification.

Exfoliation (exfoliate): Stripping of concentric rock slabs from the outer surface of a rock mass—like peeling the layers of an onion.

Felsic (felsitic): Silica-rich igneous rocks with a relatively high content of potassium- and sodium-rich minerals. These tend to form light-colored igneous rocks.

Fjords (fiords): A former glacial valley with steep walls and a U-shaped profile, now occupied by the sea.

Floodplain process group (channel types or streams): A collection of low gradient (<2%) channels flowing over alluvial deposits in lowlands and valley bottoms. High stream flows are normally not contained within the active channel banks.

Fluvial (fluvial processes): Pertaining to a river. The set of mechanisms that operate as a result of water flow within a stream channel, bringing about the erosion, transfer, and deposition of sediment.

Genesis: A coming into being; origin; creation.

Geomorphology (geomorphic processes): The scientific study of the landforms of the earth's surface and of the processes that have fashioned them.

Glacial outwash process group (channel types or streams): A collection of valley or lowland streams, with the exception of high elevation, cirque basin streams, flowing over coarse outwash deposits. These streams transport glacier meltwaters and thus have extremely high sediment loads and turbid water.

Glacial till: See Till.

Glacio-: A prefix denoting formation by or relationship to glaciers.

Glaciofluvial: Pertaining to streams flowing from glaciers or to the deposits made by such streams.

Glaciolacustrine: Pertaining to glacial-lake conditions, as in glaciolacustrine deposits, sediment deposited in glacier-margin lakes by glacial meltwaters.

Glaciomarine: Pertaining to glacial-marine conditions, as in glaciomarine deposits, sediment deposited in seawater along glacier margins by glacial meltwaters.

Graywacke: An old rock name that has been variously defined but is now generally applied to a dark and very hard coarse sandstone in an abundant and compact, (sometimes partially metamorphosed) clayey matrix having the composition of slate.

Hanging valley: A former glacial tributary valley that enters a larger valley above its base, high up on the valley wall.

High gradient contained process group (channel types or streams): A collection of shallowly to deeply incised, high gradient mountain slope streams. These headwater channels have relatively high energy and thus transport large sediment loads.

Histosols: An order of soils composed of organic materials.

Horn: A high pyramidal peak with steep sides formed by the intersecting walls of three or more cirques.

Hydrography: The description of the sea, lakes, rivers, and other aqueous portions of the earth's surface.

Hydrophilic: Water-loving.

Hypsithermal climatic optimum: A warm interglacial phase after the last glacial period, occurring about 6,000 years ago. Maximum ice shrinkage occurred during this period.

Hypsographic feature: A topographic feature with elevation portrayed with reference to sea level.

Inceptisols: An order of mineral soils that have one or more horizons in which mineral materials have been weathered or removed. Inceptisols are in the early stages of forming visible horizons, and are only beginning the development of a distinctive soil profile.

Insular: Of, relating to, or constituting an island.

Interfluve: The elevated part of the landscape that extends between two adjacent streams or valleys. It is normally seen as lying above the steeper slopes of each valley side.

Isostatic rebound: An adjustment of the land's position relative to current sea level as a result of deglaciation and the removal of the immense weight of the ice.

Isthmus: A narrow strip of land, bordered on both sides by water, that connects two larger bodies of land.

Jöknlhlaup (pronounced "YUCK-a-lup"): An Icelandic term for a glacial outburst flood—a sudden, often annual, release of meltwater from a glacier-dammed lake.

Karst (karstlands): A type of topography that develops as the result of the dissolution of soluble rocks, in this case limestones and marbles. Dissolution of the subsurface strata produces a landscape that is characterized by well-developed subsurface drainage, collapse features (such as sinkholes), dry valleys, vertical shafts, caves, and fluted rock surfaces (epikarst).

Krummholz: Gnarled, stunted, and bushy trees hampered by submarginal growing conditions, snow loading, and desiccating winds at high elevations near alpine.

Lacustrine: Pertaining to lakes.

Lacustrine limnetic wetlands: Freshwater deepwater habitats (lakes) situated in a topographic depression or a dammed river channel where vegetation does not exceed 30% cover [National Wetland Inventory].

Lacustrine littoral wetlands: Freshwater wetland habitats extending from the shoreward boundary of a lake to a depth of 6.6 feet below low water or to the maximum extent of nonpersistent emergents [National Wetland Inventory].

Lahar: A torrential flow or flood of water-saturated volcanic debris down the slopes of a volcano. This type of landslide results when *pyroclastic* materials resting on the flanks of a volcano become saturated with water and gush downslope.

Lake process group: A collection of tranquil waters occurring in deepwater basins.

Lineament: A conspicuous topographic line that is structurally controlled. These are significant lines of the landscape that reveal the hidden architecture of the bedrock.

Lithology: The physical character and description of a rock and/or outcrop.

Little Ice Age: A period of worldwide glacier expansion and contraction spanning from approximately 1450 to 1850. This is considered one of several neoglacial pulses of ice.

Loess: Unconsolidated, wind-deposited sediment composed of silts and fine sands and showing little or no stratification. Soils derived from these wind-blown materials are quite fertile.

Low gradient contained process group (channel types or streams): A collection of low gradient (1-3%) channels that are moderately incised with good flow containment. These are larger valley or lowland streams often having limited areas of alluvial sediment deposition within the confines of the upper banks.

Mafic: Silica-poor igneous rocks with a relatively high content of magnesium-, iron-, and calcium-rich minerals. These tend to be dark-colored igneous rocks.

Magma: Molten rock material which forms igneous rocks after cooling.

Megalineament: A major, pronounced topographic and structural *lineament*. In Southeast Alaska, the Coast Range megalineament demarcates the Coast Range batholith from Nakat Inlet northwards through Behm Canal, Thomas Bay, Endicott Arm, Port Snettisham, Gastineau Channel, and Berners Bay to Lynn Canal (see Brew and Ford 1978; Gehrels and Berg 1992).

Metamorphism (metamorphosed): In geology, any change in the texture or composition of a rock due to heat, pressure, and chemicals. The recrystallization of pre-existing rocks in response to exterior forces.

Micaceous: Consisting of, containing, or like mica (mica is a mineral that divides into thin, partly transparent layers).

Moderate gradient contained process group (channel types or streams): A collection of moderately sloping streams where flow is completely contained by adjacent landforms and upper channel banks. Stream bank and streambed erosion is frequently controlled by the presence of bedrock outcrops.

Moderate gradient mixed control process group (channel types or streams): A collection of moderately sloping streams where sediment deposition processes are limited. Channel banks are frequently composed of boulder or bedrock materials that limit channel migration and flood plain development.

Neoglacial: This term refers to glacier expansions subsequent to maximum ice retraction of the *Hypsithermal climatic optimum*. Pulses of neoglacial ice have occurred during the last 5,000 years.

Nunatak: A mountain peak or range that was formerly surrounded but not overridden by glacial ice. A mountaintop that protrudes through the surface of a glacier or icefield.

Orographic: Applied to the rain or cloud caused by the effects of mountains on air streams that cross them. Orographic clouds and rain are produced by the condensation of moist air during its ascent over mountains.

Oxbow: A crescent-shaped lake formed in an abandoned river bend which has become separated from the main stream by a change in the course of the river.

Paleoendemic: A remnant of a relictual fauna that was more widely distributed prior to the last glaciation.

Palustrine: Pertaining to swamps or marshes, and to materials deposited in a wetland environment.

Palustrine aquatic bed wetlands: Freshwater wetlands and deepwater habitats dominated by plants that grow principally on or below the water surface for most of the growing season [National Wetland Inventory].

Palustrine emergent wetlands: Freshwater wetlands characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens [National Wetland Inventory].

Palustrine forested wetlands: Freshwater wetlands and deepwater habitats characterized by woody vegetation (trees) that is 20 feet tall or greater [National Wetland Inventory].

Palustrine moss-lichen wetlands: Freshwater wetlands dominated by mosses and lichens [National Wetland Inventory].

Palustrine process group (channel types or streams): A collection of very low gradient (<1%) streams associated with low relief landforms and wetland drainage networks. Water movement is slow, sediment transport is low, and fine organic and inorganic sediments are often trapped and stored in these channel types.

Palustrine scrub-shrub wetlands: Freshwater wetlands and deepwater habitats dominated by woody vegetation (shrubs, young or stunted trees) less than 20 feet tall [National Wetland Inventory].

Palustrine unconsolidated bottom wetlands: Freshwater wetlands and deepwater habitats with at least 25% cover of particles smaller than stones, and a vegetative cover of >30% [National Wetland Inventory].

Palustrine unconsolidated shore wetlands: Freshwater wetland habitats characterized by substrates lacking vegetation except for pioneering plants that become established during brief periods when growing conditions are favorable [National Wetland Inventory].

Parabolic dunes: A wind-created sand mound having the form of a parabola, with the concave side toward the wind. Loosely applied to any U-shaped or V-shaped sand dune concave toward the wind.

Pleistocene: The first of two epochs of the Quaternary period, lasting from approximately 1.64 million years ago to the beginning of the Holocene, about 10,000 years ago. This epoch is marked by several glacial and interglacial episodes in the northern hemisphere, and is also called the Glacial epoch.

Plucking: The loosening and removal of rock fragments or larger blocks by glaciers that involves several different mechanisms such as crushing and fracturing, freezing-on, ice movement and variations in water pressure.

Plutonic (pluton): Igneous rocks formed at great depth.

Potential natural community (potential natural vegetation): The vegetation type that represents the endpoint of succession on a given land area; an assemblage of plants representing the climax of vegetative succession.

Pyroclastic: Volcanic rock fragments formed by a volcanic explosion.

Refugium (pl. refugia): An isolated area where extensive changes, most typically due to changing climate and glaciation, have not occurred. Plants and animals formerly characteristic of the region find a refuge in these areas until favorable conditions return.

Residuum: Materials remaining from the *in situ* weathering of bedrock.

Riparian: Pertaining to a riverbank or banks along a body of water.

Riverine wetlands: Freshwater wetland and deepwater habitats contained within a channel, excluding vegetated (tree, shrubs, emergents, mosses, lichens) wetlands [National Wetland Inventory].

Scoria cone: A volcanic cone built of loose, rubbly, *pyroclastic* ejecta or cinders.

Scree (scree slope): An accumulation of coarse rock debris at the base of a cliff or mantling a mountain slope. This term is basically interchangeable with *talus*.

Spodosols: An order of mineral soils having distinct horizons where organic matter and sesquioxides (iron and aluminum) have leached (albic horizons) and accumulated (spodic horizons).

Stream process group: A grouping of channel types formed and maintained by the same or similar fluvial processes. Process groups reflect the long-term interaction of geology, landform, climate, and riparian vegetation and characterize the basic interrelations among runoff, sediment transport, and vegetation patterns along stream banks.

Supratidal: That portion of a tidal flat that lies above the level of mean high water for spring tides. It is inundated only occasionally by exceptionally high tides or storm surges.

Surficial geology (surficial deposits): The study and description of unconsolidated surface deposits of fluvial, colluvial, aeolian, or glacial origin.

Talus (talusfields): A sloping heap of rocks formed at the base of a cliff due to weathering.

Tectonics (tectonism): Of, or pertaining to, forces generated from within the earth that result in uplift, movement, or deformation of part of the earth's crust.

Terrain: A geographical area with a particular physical character; the tract or region of ground immediately under observation.

Terrane: A fault-bounded geologic entity characterized by a distinctive stratigraphic sequence and/or a structural history differing markedly from those of an adjoining neighbor.

Till: An unsorted mix of unconsolidated sediments and rocks carried and deposited by a glacier.

Tuff: A rock formed from fine-grained *pyroclastic* (rock fragments formed by volcanic explosion) particles (ash and dust).

Undivided: A mixture of rock types that are not differentiated by geologic mapping; referred to as complexes.

Upland: A terrestrial surface devoid of or lacking wetlands [National Wetland Inventory].

Species Reference List

Common name	Scientific name
Plants	
Western Hemlock	*Tsuga heterophylla*
Mountain Hemlock	*Tsuga mertensiana*
Sitka Spruce	*Picea sitchensis*
Lodgepole Pine or Shore Pine	*Pinus contorta* var. *contorta*
Western Redcedar	*Thuja plicata*
Alaska Yellow-cedar or Yellow-cedar	*Chamaecyparis nootkatensis*
Pacific silver fir	*Abies amabilis*
Cottonwood or Black Cottowood	*Populus balsamifera* subsp. *trichocarpa*
Red Alder	*Alnus rubra*
Sitka Alder	*Alnus viridis* subsp. *sinuata*
Willow	*Salix* spp.
Scouler's Willow	*Salix scouleriana*
Salal	*Gaultheria shallon*
Steeplebush	*Spiraea douglasii* spp. *douglasii*
Sword Fern	*Polystichum munitum*
Kruckeberg's Holly Fern	*Polystichum Kruckebergii*
Hemlock Dwarf Mistletoe	*Arceuthobium tsugense*
Dwarf Fireweed	*Epilobium latifolium*
Birds[1]	
Red-throated Loon	*Gavia stellata*
Pacific Loon	*Gavia pacifica*
Common Loon	*Gavia immer*
Yellow-billed Loon	*Gavia adamsii*
Horned Grebe	*Podiceps auritus*
Forked-tailed Storm Petrel	*Oceanodroma furcata*
Leach's Storm Petrel	*Oceanodroma leucorhoa*
Double-crested Cormorant	*Phalacrocorax auritus*
Brandt's Cormorant	*Phalacrocorax penicillatus*
Pelagic Cormorant	*Phalacrocorax pelagicus*
Red-faced Cormorant	*Phalacrocorax urile*
American Bittern	*Botaurus lentiginosus*
Great Blue Heron	*Ardea herodias*
Tundra Swan	*Cygnus columbianus*
Trumpeter Swan	*Cygnus buccinator*
Greater White-fronted Goose	*Anser albifrons*
Snow Goose	*Chen caerulescens*
Brant	*Branta bernicla*
Canada Goose	*Branta canadensis*
Green-winged Teal	*Anas crecca*
Mallard	*Anas platyrhynchos*
Northern Pintail	*Anas acuta*
Blue-winged Teal	*Anas discors*
Northern Shoveler	*Anas clypeata*
Gadwall	*Anas strepera*
Eurasian Wigeon	*Anas penelope*
American Wigeon	*Anas americana*
Redhead	*Aythya americana*
Ring-necked Duck	*Aythya collaris*
Greater Scaup	*Aythya marila*
Lesser Scaup	*Aythya affinis*
Steller's Eider	*Polysticta stelleri*
Harlequin Duck	*Histrionicus histrionicus*
Oldsquaw	*Clangula hyemalis*
Black Scoter	*Melanitta nigra*
Surf Scoter	*Melanitta perspicillata*
White-winged scoter	*Melanitta fusca*
Common Goldeneye	*Bucephala clangula*
Barrow's Goldeneye	*Bucephala islandica*
Bufflehead	*Bucephala albeola*
Hooded Merganser	*Lophodytes cucullatus*
Common Merganser	*Mergus merganser*
Red-breasted Merganser	*Mergus serrator*
Osprey	*Pandion haliaetus*
Bald Eagle	*Haliaeetus leucocephalus*
Northern Harrier	*Circus cyaneus*
Sharp-shinned Hawk	*Accipiter striatus*
Northern Goshawk	*Accipiter gentilis*
Red-tailed Hawk	*Buteo jamaicensis*
Golden Eagle	*Aquila chrysaetos*
American kestrel	*Falco sparverius*
Merlin	*Falco columbarius*
Peregrine Falcon	*Falco peregrinus*
Gyrfalcon	*Falco rusticolus*
Spruce Grouse	*Dendragapus canadensis*
Blue Grouse	*Dendragapus obscurus*
Willow Ptarmigan	*Lagopus lagopus*
Ruffed Grouse	*Bonasa umbellus*
Sora Rail	*Porzana carolina*
American Coot	*Fulica americana*
Sandhill Crane	*Grus canadensis*
Black-bellied Plover	*Pluvialis squatarola*
Lesser Golden Plover	*Pluvialis dominica*
Semipalmated Plover	*Charadrius semipalmatus*
Killdeer	*Charadrius vociferus*
Black Oystercatcher	*Haematopus bachmani*

Greater Yellowlegs	*Tringa melanoleuca*
Lesser Yellowlegs	*Tringa flavipes*
Solitary Sandpiper	*Tringa solitaria*
Wandering Tattler	*Heteroscelus incanus*
Spotted Sandpiper	*Actitus macularia*
Whimbrel	*Numenius phaeopus*
Hudsonian Godwit	*Limosa haemoastica*
Bar-tailed Godwit	*Limosa lapponica*
Ruddy Turnstone	*Arenaria interpres*
Black Turnstone	*Arenaria melanocephala*
Surfbird	*Aphriza virgata*
Red Knot	*Calidris canutus*
Sanderling	*Calidris alba*
Semipalmated Sandpiper	*Calidris pusilla*
Western Sandpiper	*Calidris mauri*
Least Sandpiper	*Calidris minutilla*
Baird's Sandpiper	*Calidris bairdii*
Pectoral Sandpiper	*Calidris melanotos*
Rock Sandpiper	*Calidris ptilocnemis*
Dunlin	*Calidris alpina*
Stilt Sandpiper	*Calidris himantopus*
Short-billed Dowitcher	*Limnodromus griseus*
Long-billed Dowitcher	*Limnodromus scolopaceus*
Common Snipe	*Gallinago gallinago*
Red-necked Phalarope	*Phalaropus lobatus*
Bonaparte's Gull	*Larus philadelphia*
Mew Gull	*Larus canus*
Ring-billed Gull	*Larus delawarensis*
California Gull	*Larus californicus*
Herring Gull	*Larus argentatus*
Thayer's Gull	*Larus thayeri*
Glaucous-winged Gull	*Larus glaucescens*
Glaucous Gull	*Larus hyperboreus*
Black-legged Kittiwake	*Rissa tridactyla*
Caspian Tern	*Sterna caspia*
Arctic Tern	*Sterna paradisaea*
Aleutian Tern	*Sterna aleutica*
Common Murre	*Uria aalge*
Thick-billed Murre	*Uria lomvia*
Pigeon Guillemot	*Cepphus columba*
Marbled Murrelet	*Brachyramphus marmoratus*
Kittlitz's Murrelet	*Brachyramphus brevirostris*
Ancient Murrelet	*Synthliboramphus antiquus*
Cassin's Auklet	*Ptychoramphus aleuticus*
Rhinoceros Auklet	*Cerorhinca monocerata*

Western Screech Owl	*Otus kennicottii*
Great Horned Owl	*Bubo virginianus*
Northern Hawk Owl	*Surnia ulula*
Northern Pygmy Owl	*Glaucidium gnoma*
Boreal Owl	*Aegolius funereus*
Great Gray Owl	*Strix nebulosa*
Short-eared Owl	*Asio flammeus*
Northern Saw-whet Owl	*Aegolius acadicus*
Rufous Hummingbird	*Selasphorus rufus*
Belted Kingfisher	*Ceryle alcyon*
Red-breasted Sapsucker	*Sphyrapicus ruber*
Downy Woodpecker	*Picoides pubescens*
Hairy Woodpecker	*Picoides villosus*
Three-toed Woodpecker	*Picoides tridactylus*
Black-backed Woodpecker	*Picoides arcticus*
Northern Flicker	*Colaptes auratus*
Olive-sided Flycatcher	*Contopus borealis*
Western Wood-pewee	*Contopus sordidulus*
Alder Flycatcher	*Empidonax alnorum*
Hammond's Flycatcher	*Empidonax hammondii*
Pacific Slope Flycatcher	*Empidonax difficilis*
Tree Swallow	*Tachycineta bicolor*
Violet-green Swallow	*Tachycineta thalassina*
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*
Bank Swallow	*Riparia riparia*
Cliff Swallow	*Hirundo pyrrhonota*
Barn Swallow	*Hirundo rustica*
Gray Jay	*Perisoreus canadensis*
Steller's Jay	*Cyanocitta stelleri*
Black-billed Magpie	*Pica pica*
Northwestern Crow	*Corvus caurinus*
Common Raven	*Corvus corax*
Black-capped Chickadee	*Parus atricapillus*
Chestnut-backed Chickadee	*Parus rufescens*
Red-breasted Nuthatch	*Sitta canadensis*
Brown Creeper	*Certhia americana*
Winter Wren	*Troglodytes troglodytes*
American Dipper	*Cinclus mexicanus*
Golden-crowned Kinglet	*Regulus satrapa*
Ruby-crowned Kinglet	*Regulus calendula*
Townsend's Solitaire	*Myadestes townsendi*
Gray-cheeked Thrush	*Catharus minimus*
Swainson's Thrush	*Catharus ustulatus*
Hermit Thrush	*Catharus guttatus*
American Robin	*Turdus migratorius*

Varied Thrush	*Ixoreus naevius*
American Pipit	*Anthus spinoletta*
Bohemian Waxwing	*Bombycilla garrulus*
Cedar Waxwing	*Bombycilla cedrorum*
Northern Shrike	*Lanius excubitor*
Warbling Vireo	*Vireo gilvus*
Red-eyed Vireo	*Vireo olivaceus*
Tennessee Warbler	*Vermivora peregrina*
Orange-crowned Warbler	*Vermivora celata*
Yellow Warbler	*Dendroica petechia*
Yellow-rumped Warbler	*Dendroica coronata*
Townsend's Warbler	*Dendroica townsendi*
Blackpoll Warbler	*Dendroica striata*
American Redstart	*Setophaga ruticilla*
Northern Waterthrush	*Seiurus noveboracensis*
MacGillivray's Warbler	*Oporornis tolmiei*
Common Yellowthroat	*Geothlypis trichas*
Wilson's Warbler	*Wilsonia pusilla*
Western Tanager	*Piranga ludoviciana*
American Tree Sparrow	*Spizella arborea*
Chipping Sparrow	*Spizella passerina*
Savannah Sparrow	*Passerculus sandwichensis*
Fox Sparrow	*Passerella iliaca*
Song Sparrow	*Melospiza melodia*
Lincoln's Sparrow	*Melospiza lincolnii*
Golden-crowned Sparrow	*Zonotrichia atricapilla*
White-crowned Sparrow	*Zonotrichia leucophrys*
Dark-eyed Junco	*Junco hyemalis*
Snow bunting	*Plectrophenax nivalis*
Red-winged Blackbird	*Agelaius phoeniceus*
Rusty Blackbird	*Euphagus carolinus*
Brown-headed Cowbird	*Molothrus ater*
Pine Grosbeak	*Pinicola enucleator*
Red Crossbill	*Loxia curvirostra*
White-winged Crossbill	*Loxia leucoptera*
Pine Siskin	*Carduelis pinus*
Mammals[2]	
Common Shrew	*Sorex cinereus*
Dusky Shrew	*Sorex monticolus*
Water Shrew	*Sorex palustris*
Glacier Bay Water Shrew	*Sorex alaskanus*
Little Brown Myotis	*Myotis lucifugus*
Keen's Myotis	*Myotis keenii*
Long-legged Myotis	*Myotis volans*
California Myotis	*Myotis californicus*

Silver-haired Bat	*Lasionycteris noctivagans*
Collared Pika	*Ochotona collaris*
Snowshoe Hare	*Lepus americanus*
Hoary Marmot	*Marmota caligata*
Arctic Ground Squirrel	*Spermphilus parryii*
Red Squirrel	*Tamiasciurus hudsonicus*
Northern Flying Squirrel	*Glaucomys sabrinus*
Beaver	*Castor canadensis*
Keen's Mouse	*Peromyscus keeni*
Bushy-tailed Woodrat	*Neotoma cinerea*
Northern Red-backed Vole	*Clethrionomys rutilus*
Southern Red-backed Vole	*Clethrionomys gapperi*
Meadow Vole	*Microtus pennsylvanicus*
Tundra Vole	*Microtus oeconomus*
Long-tailed Vole	*Microtus longicaudus*
Coronation Island Vole	*Microtus coronarius*
Muskrat	*Ondatra zibethicus*
Northern Bog Lemming	*Synaptomys borealis*
Meadow Jumping Mouse	*Zapus hudsonius*
Western Jumping Mouse	*Zapus princeps*
Porcupine	*Erethizon dorsatum*
Coyote	*Canis latrans*
Wolf	*Canis lupus*
Red Fox	*Vulpes vulpes*
Arctic Fox	*Alopex lagopus*
Black Bear	*Ursus americanus*
Brown Bear	*Ursus arctos*
Steller's Sea Lion	*Eumetopias jubatus*
California Sea Lion	*Zalophus californianus*
Northern Fur Seal	*Callorhinus ursinus*
Harbor Seal	*Phoca vitulina*
Northern Elephant Seal	*Mirounga angustirostris*
Raccoon	*Procyon lotor*
Marten	*Martes americana*
Fisher	*Martes pennanti*
Ermine	*Mustela erminea*
Least Weasel	*Mustela nivalis*
Mink	*Mustela vison*
Wolverine	*Gulo gulo*
River Otter or Land Otter	*Lontra canadensis*
Sea Otter	*Enhydra lutris*
Mountain Lion	*Puma concolor*
Canada Lynx	*Lynx canadensis*
Elk[3]	*Cervus elaphus*
Sitka Black-tailed Deer	*Odocoileus hemionus*

Moose	*Alces alces*
Caribou	*Rangifer tarandus*
Mountain Goat	*Oreamnos americanus*
Dall's Sheep	*Ovis dalli*
Northern Right Whale	*Eubalaena glacialis*
Gray Whale	*Eschrichtius robustus*
Blue Whale	*Balaenoptera musculus*
Fin Whale	*Balaenoptera physalus*
Sei Whale	*Balaenoptera borealis*
Minke Whale	*Balaenoptera acutorostrata*
Humpback Whale	*Megaptera novaeangliae*
Sperm Whale	*Physeter catodon*
White Whale or Beluga	*Delphinapterus leucas*
North Pacific Bottle-nosed Whale	*Berardius bairdii*
Bering Sea Beaked Whale	*Mesoplodon stejnegeri*
Goose-beaked Whale	*Ziphius cavirostris*
Killer Whale or Orca	*Orcinus orca*
Short-finned Pilot Whale	*Globicephala macrorhynchus*
Pacific White-sided Dolphin	*Lagenorhynchus obliquidens*
Risso's Dolphin	*Grampus griseus*
Harbor Porpoise	*Phocoena phocoena*
Dall's Porpoise	*Phocoenoides dalli*
Fishes	
Coho Salmon	*Oncorhynchus kisutch*
Chum Salmon	*Oncorhynchus keta*
Pink Salmon	*Oncorhynchus gorbuscha*
Sockeye Salmon	*Oncorhynchus nerka*
Chinook Salmon	*Oncorhynchus tschawytscha*
Steelhead	*Oncorhynchus mykiss*
Cuttroat	*Oncorhynchus clarki*
Eulachon	*Thaleichthys pacificus*
Dolly Varden	*Salvelinus malma*
Insects	
Spruce Beetle	*Dendroctonus rufipennis*
Hemlock Sawfly	*Neodiprion tsugae*

1 = Complete bird listing based on Bunnell and Chan-McLeod (1997).
2 = Complete mammal listing based on MacDonald and Cook (1999).
3 = Introduced to Southeast Alaska.

Appendix A. Citation list of geologic maps used in the delineation of ecological subsections in Southeast Alaska.

Baichtal, J.F. and C.E. Cooper. 1994. Reconnaissance geology of central Prince of Wales Island, portions of the Craig D-3 and Craig D-4 quadrangles, southeastern Alaska. Unpublished U.S. Forest Service/Harza Data. (Map scale 1:15,840)

Baichtal, J.F. 1995. Reconnaissance geologic map of the Lancaster Peninsula and eastern Cholmondeley Sound area, southeastern Alaska. Unpublished U.S. Forest Service Data. (Map scale 1:15,840)

Baichtal, J.F. 1997. Reconnaissance geologic map of the area south of Luck Lake, central Prince of Wales Island, portions of the Craig D-3 quadrangle, southeastern Alaska. Unpublished U.S. Forest Service Data. (Map scale 1:15,840)

Baichtal J.F. and J. DeMontigny. 1999. Reconnaissance mapping and monitoring of the geology and karst resources in the vicinity of Kindergarten Bay, Etolin Island, Alaska. Unpublished U.S. Forest Service Data. (Map scale 1:15,840)

Baichtal, J.F. and R. Wilson. 2001. Reconnaissance geologic map of the Shoal Cove area, portions of Ketchikan B-4 and Ketchikan C-4 quadrangles, southeastern Alaska. Unpublished U.S. Forest Service/Harza Data. Work in Progress. (Map scale 1:15,840)

Baichtal, J.F., R. Langendoen, N.J. Darigo, and K. McGee-Prussian. 2001(a). Reconnaissance geologic map of eastern Kosciusko Island, portions of Craig C-5, Craig C-6, Petersburg A-4, and Petersburg A-5 quadrangles, southeastern Alaska. Unpublished U.S. Forest Service/URS Data. Work in Progress. (Map scale 1:15,840)

Baichtal, J.F., R. Langendoen, N.J. Darigo, and K. McGee-Prussian. 2001(b). Reconnaissance geologic map of Tuxekan Island, portions of Craig D-4 and Craig D-5 quadrangles, southeastern Alaska. Unpublished U.S. Forest Service/URS Data. Work in Progress. (Map scale 1:15,840)

Beikman, H.M. 1975. Preliminary geologic map of southeastern Alaska. U.S. Geological Survey Miscellaneous Field Studies Map MF-673, 2 sheets. (Map scale 1:1,000,000.)

Berg, H.C. 1973. Geology of Gravina Island, Alaska. U.S. Geological Survey Bulletin 1373. (Map scale 1:63,360)

Berg, H.C., R.L. Elliott, and R.D. Koch. 1988. Geologic map of the Ketchikan and Prince Rupert quadrangles, southeastern Alaska. U.S. Geological Survey Mineral Investigations Series Map MF-1807, 27 p. pamphlet. (Map scale 1:250,000.)

Bielefield, R.J., C.E. Cooper, and J.F. Baichtal. 1997. Reconnaissance geologic map of Control Lake area, central Prince of Wales Island, portions of the Craig C-3 and Craig D-3 quadrangles, southeastern Alaska. Unpublished U.S. Forest Service/Harza Data. (Map scale 1:15,840)

Brew, D.A. (Compiler). 1996. Geologic map of the Craig, Dixon Entrance, and parts of the Ketchikan and Prince Rupert quadrangles, southeastern Alaska. U.S. Geological Survey Miscellaneous Field Investigations Series Map MF-2319, 2 sheets, 53 p. pamphlet. (Map scale 1:250,000.)

Brew, D.A. 1997. Reconnaissance bedrock geologic map of Glacier Bay National Park, Alaska, in Glacier Bay Ecosystem GIS CDROM. U.S. Geological Survey, Biological Resources Division; available from J. Geiselman, USDS/BRD, 1011 E. Tudor Road, Anchorage, AK 99503-6199. (Digitized from 1:125,000-scale map.)

Brew, D.A. and A.B. Ford. 1985. Preliminary reconnaissance geologic map of the Juneau, Taku River, Atlin and part of the Skagway 1:250,000 quadrangles, southeastern Alaska. U.S. Geological Survey Open-File Report 85-395, 2 sheets, 23 p. pamphlet. (Map scale 1:250,000.)

Brew, D.A. and D. Grybeck. 1984. Geology of the Tracy Arm-Fords Terror Wilderness Study Area and vicinity, Alaska. P. 19-52 *in* Mineral resources of the Tracy Arm-Fords Terror Wilderness Study Area and vicinity, Alaska. U.S. Geological Survey Bulletin 1525. (Map scale 1:125,000.)

Brew, D.A., S.M. Karl, D.F. Barnes, R.C. Jachens, A.B. Ford, and R. Horner. 1991. A northern Cordilleran ocean-continent transect: Sitka Sound to Atlin Lake, British Columbia. Canadian Journal of Earth Sciences 28:840-853. (Map scale 1:925,926.)

Brew, D.A., A.T. Ovenshine, S.M. Karl, and S.J. Hunt. 1984. Preliminary reconnaissance geologic map of Petersburg and parts of Port Alexander and Sumdum 1:250,000 quadrangles, southeastern Alaska. U.S. Geological Survey Open-File Report 84-405, 43 p., 2 sheets. (Map scale 1:250,000.)

Churkin, M. and D.M. Eberlein. 1975. Geologic Map of the Craig C-4 Quadrangle, Alaska. U.S. Geological Survey Geological Quadrangle Map GQ-1169. (Map scale 1:63,360)

Clark, A.L., H.C. Berg, D. Grybeck, and A.T. Overshine. 1971. Reconnaissance geology and geochemistry of Forrester Island National Wildlife Refuge, Alaska. U.S. Geological Survey Open File Report 343. (Map scale 1:63,360)

Clautice, K.H., W.G. Gilbert, M.A. Wiltse, M.B. Werdon, and T.X. Homza. 1994. Geology of the Helm Bay area, portions of the Craig C-1 and Ketchikan C-6 quadrangles, southeastern Alaska. Alaska Division of Geological and Geophysical Surveys Public-Data File 94-41. (Map scale 1:63,360)

Condon, W.H. 1961. Geology of the Craig Quadrangle, Alaska. U.S. Geological Survey Bulletin 1108-B. (Map scale 1:250,000)

Eberlein, G.D., M. Churkin, C. Carter, H.E. Berg, and A.T. Overshine. 1983. Geology of the Craig quadrangle, Alaska. U.S. Geological Survey Open File Report 83-91. (Map scale 1:250,000)

Gehrels, G.E. 1991. Geologic Map of Long Island and southern and central Dall Island, southeastern Alaska. U.S. Geological Survey Miscellaneous Field Studies Map MF-2146. (Map scale 1:63,360)

Gehrels, G.E. 1992. Geologic map of the southern Prince of Wales Island, southeastern Alaska. U.S. Geological Survey Miscellaneous Investigation Series Map I-2169. (Map scale 1:63,360)

Gehrels, G.E. and H.C. Berg. 1992. Geologic map of southeastern Alaska. U.S. Geological Survey Miscellaneous Investigations Map I-1867. (Map scale 1:600,000.)

Gilbert, W.G., A.H. Clough, L.E. Burns, J.T. Kline, E. Redman, and E.J. Fogels. 1990. Reconnaissance geology and geochemistry of the northeast Skagway quadrangle, Alaska. Alaska Division of Geological and Geophysical Surveys Report of Investigations 90-5, 1 sheet. (Map scale 1:125,000.)

Glavinovich, P.S. and J.F. Baichtal. 1994. Reconnaissance geologic map of the Lancaster Peninsula and eastern Cholmondeley Sound area, southeastern Alaska. Unpublished Data provided by Sealaska Corporation and modified by Baichtal during field reconnaissance on the Chasina EIS. (Map scale 1:15,840).

Herreid, G. and M.A. Kaufman. 1964. Geology of the Dry Pass area, southeastern Alaska. State of Alaska, Department of Natural Resources, Division of Mines and Minerals Geologic Report No. 7. (Map scale 1:31,680)

Herreid, G., T.K. Bundtzen, and D.L. Turner. 1978. Geology and geochemistry of the Craig A-2 quadrangle and vicinity, Prince of Wales Island, southeastern Alaska. Alaska Division of Geological and Geophysical Surveys Geologic Report 48. (Map scale 1:40,000)

Johnson, B.R. and S.M. Karl. 1985. Geologic map of western Chichagof and Yakobi Islands, southeastern Alaska. U.S. Geological Survey Miscellaneous Investigations Series Map I-1506, 1 sheet. (Map scale 1:125,000.)

Karl, S.M., P.J. Haeussler, and A.E. McCafferty, 1999. Reconnaissance geologic map of the Duncan Canal/Zarembo Island area, southeastern Alaska. U.S. Geological Survey Open File Report 99-168. (Map scale 1:63,360)

Appendix A. Citation list of geologic maps used in the delineation of ecological subsections in Southeast Alaska.

Koch, R.D. and H.C. Berg. 1996. Reconnaissance geologic map of the Bradfield Canal quadrangle, southeastern Alaska. U.S. Geological Survey Open-File Report 81-728-A, 35 p. pamphlet. (Map scale 1:250,000.)

Lathram, E.H., J.S. Pomeroy, H.C. Berg, and R.A. Loney. 1965. Reconnaissance geology of Admiralty Island, Alaska. U.S. Geological Survey Bulletin 1181-R, p. R1-R48. (Map scale 1:250,000)

Loney, R.A., D.A. Brew, L.J.P. Muffler, and J.S. Pomeroy. 1975. Reconnaissance geology of Chichagof, Baranof, and Kruzof Islands, southeastern Alaska. U.S. Geological Survey Professional Paper 792, 105 p. (Map scale 1:250,000.)

Miller, R.D. 1973. Gastineau Channel Formation, a composite glaciomarine deposit near Juneau, Alaska. U.S. Geological Survey Bulletin 1394-C, Government Printing Office, Washington, D.C. (Map scale 1:48,000)

Plafker, G. 1967. Geologic map of the Gulf of Alaska Tertiary province. Alaska. U.S. Geological Survey Miscellaneous Geologic Investigations Map I-484. (Map scale 1:500,000.)

Reed, J.C. and R.R. Coats. 1941. Geology and ore deposits of the Chichagof Mining District, Alaska. U.S. Geological Survey Bulletin 929, U.S. Government Printing Office, Washington, DC. 148 p. (Map scale 1:62,500)

Riehle, J.R., D.A. Brew, and M.A. Lanphere. 1989. Geologic map of the Mount Edgecumbe volcanic field, Kruzof Island, southeastern Alaska. U.S. Geological Survey Map I-1983. (Map scale 1:63,360.)

Rossman, D.L. 1959. Geology and ore deposits of northwestern Chichagof Island, Alaska. U.S. Geological Survey Bulletin 1058-E, U.S. Government Printing Office, Washington, DC. 216 p. (Map scale 1:63,360)

Rossman, D.L. 1963. Geology of the eastern part of the Mount Fairweather quadrangle, Glacier Bay, Alaska. U.S. Geological Survey Bulletin 1121-K, p. K1-K57. (Map scale 1:63,360)

Data Layers

A digital elevation model (DEM) covering Southeast Alaska was used to derive elevation, slope, aspect, and topographic roughness data. A DEM consists of a regular array of elevations referenced horizontally on the geographic coordinate system. This exercise used 15-minute DEMs that match the spatial format of the 1:63,360-scale source contours. The accuracy of the DEM data, together with the data spacing of 60 meters, adequately support computer applications that analyze *hypsographic features* to a level of detail similar to manual interpretations of information as printed at map scales not larger than 1:63,360. The plotting of contours from the 15-minute Alaska DEMs at scales larger than 1:63,360, or reliance on the elevation heights without incorporating the National Mapping Accuracy Standards (NMAS) horizontal error tolerance, will produce less reliable results (U.S. Geological Survey 1990). These tasks were performed using Environmental Systems Research Institute's (ESRI) raster analysis module. Slope and aspect were calculated using a 3x3 moving window. These functions fit a plane around the center cell of the window. The direction the plane faces is the aspect for the center cell. The slope calculation is made using the maximum average of the surrounding cells. The formula is SQRT(SQR(dz/dx) + SQR(dz/dy))*100, where the deltas (dz,dx,dy) are calculated using a 3x3 moving window. The following example represents the z-values in the window:

a b c
d e f
g h i

(dz/dx) = ((a + 2d + g) – (c + 2f + i)) / (8 * x_mesh_spacing)
(dz/dy) = ((a + 2b + c) – (g + 2h + i)) / (8 * y_mesh_spacing).

Topographic roughness was calculated using the standard deviation of values in a 3x3 moving window. Standard deviation was calculated using the values of the cells in the window and assigning the standard deviation to the center cell in the window.

The mean annual precipitation map from the Water Resources Atlas (Ott Water Engineers, Inc. 1979) was digitized into a seamless coverage for all of Southeast Alaska and then used to generate precipitation statistics for each subsection.

The common land unit inventory (CLU) was used to derive landform, parent material, soils, and forest site index. This inventory was conducted from the mid 1960s to the mid 1980s. Polygons were delineated using basic site and soil characteristics, such as landforms, soil composition, and slope. Polygons with similar land and forest characteristics were grouped under a particular soil map unit code. Map units describe a range of characteristics for the delineation, including dominant soil taxons, landforms, parent material, slope ranges, and vegetation communities. Attribute information was generated from soil physical and chemical data, including site index, mass movement potential, and hydric soil status. About 800 soil map units exist which describe over 100,000 CLU polygons across the Tongass National Forest. The inventory was mapped at a scale of 1:15,840 on color aerial photographs, with 10 to 20 acres as the minimum mapping size.

The Tongass land and timber type inventory (TIMTYP) was used to derive landcover and forest productivity. This inventory was based on aerial photography interpretation and conducted under contract by Esca-Tech Corporation (Esca-Tech Corp. 1977). The Tongass National Forest was divided into polygons based on land and forest characteristics. These polygons had a minimum size of 5 acres and averaged 60 acres (see Caouette et al. 2000 for additional information).

The harvest layer contains harvest data from 1954 to 1995 within the boundaries of the Tongass National Forest. There is also incomplete harvest data prior to 1954 back as far as 1790. Although harvests conducted on National Forest System (NFS) lands prior to conveyance to Native Corporations under the auspices of the Alaska Native Claims Settlement Act (ANCSA) are included, forest harvest on private lands is often not depicted. Thus, these data represent a conservative estimate of total harvest in Southeast Alaska.

The National Wetlands Inventory, led by the U.S. Fish & Wildlife

Service, was conducted during the 1990s for Southeast Alaska. This inventory was based on a hierarchical classification system developed by Cowardin et al. (1979). Wetland and deepwater habitats ≥ 2 acres in size were delineated using 1:60,000, color-infrared, aerial photography. For specific survey procedures and mapping protocols, refer to Hall et al. (1994, 1996) and Brock (1995).

Land use designations were based on the Modified 1997 Tongass Land and Resource Management Plan (USDA Forest Service 1999).

The Tongass streams layer is the source of stream *hydrography* used in this report. This GIS layer contains several attributes including *stream process group* classification. Process groups are defined by consistent regional criteria (Paustian 1992) that follow the national "Hierarchical Framework of Aquatic Ecological Units" (Maxwell et al. 1995). Process groups categorize stream segments with similar morphologic characteristics that are influenced by similar *fluvial* and *riparian* processes. These stream strata are highly correlated with habitat capability and diversity for a range of aquatic- and riparian-dependent fauna.

Stream process group mapping was initially done between 1980 and 1993 on 1:15,840 scale, color, aerial photography and 1:63,000 scale, high-resolution, infrared, aerial photography. A consistent, well-defined mapping protocol was used across the entire Forest. A total of 47,000 stream miles are contained in this Tongass-wide streams layer. The classification and mapping accuracy for the original photo interpretive mapping is estimated at 80% for most perennial stream channels. Stream mapping errors are likely to be greater in subsections dominated by sedimentary-carbonate, metacarbonate, and volcanic/extrusive lithologies.

Data Queries

Data queries were run for 16 variables including elevation, aspect, slope, topographic roughness, precipitation, landform, parent material, soils, landcover, forest productivity, forest site index, forest harvest, wetlands, land use designations, *stream process groups*, and roads. Query specifications for each variable follow:

Elevation: Each grid cell was populated with elevation data using the DEM cover. Elevation data were grouped into 7 classes (0-499', 500-999', 1000-1999', 2000-2999', 3000-3999', 4000-4999', and ≥5000') and frequency percentages were calculated for each class. Frequency data are displayed in bar graphs in each subsection description and in tabular form in Appendix C.

Aspect: The DEM was used to derive aspect. For a given grid cell, aspect was calculated by comparing the elevations from the surrounding 8 cells (3x3 matrix). Nine aspect classes were designated covering the 8 major cardinal directions (north, northeast, east, southeast, south, southwest, west, northwest) and flat surfaces (no aspect). Frequency percentages were calculated for each class and displayed in radar graphs in each subsection description and in tabular form in Appendix D.

Slope: Percent slope was calculated for each grid cell by comparing the elevations from the surrounding 8 cells (3x3 matrix). Percent slope data were grouped into 5 classes (0-14%, 15-34%, 35-54%, 55-74%, and ≥75%) and converted to frequency percentages. Frequency data are displayed in bar graphs in each subsection description and in tabular form in Appendix E.

Topographic Roughness: Topographic roughness was calculated using the standard deviation of elevations from surrounding grid cells (3x3 matrix). From these data, mean topographic roughness was calculated for each subsection. Topographic roughness values were grouped into 5 classes for descriptive purposes (0-19 = smooth, 20-39 = rolling, 40-59 = rough, 60-79 = very rough, 80+ = extremely rough). Roughness statistics were summarized for each subsection to provide the values in Appendix F.

Precipitation: Isohyetal data from a mean annual precipitation map (Ott Water Engineers, Inc. 1979) were extrapolated into the grid. Precipitation isolines were converted into a continuous precipitation surface. This continuous surface was then used to calculate mean annual precipitation for each subsection. Descriptive statistics of mean annual precipitation appear in Appendix G. Five annual precipitation classes were recognized for descriptive purposes (<50" = low, 50-99" = moderate, 100-149" =

moderately high, 150-199" = high, 200"+ = very high).

Landform Association: The primary landform (LF1) for each CLU unit was used to populate the grid. Landforms were grouped into 7 landform associations per the USFS Alaska Region Classification Guide (Brock et al. 1996) and include mountain summits, mountain slopes, hills, valley floor, lowlands, coastal, and volcanic. Frequency percentages were calculated for the above classes by subsection. Frequency data are listed in each subsection description (top 5-ranked classes) and collectively in Appendix H.

Parent Material: The primary parent material (PM1) for each CLU unit was used to populate the grid with parent material data. Seventeen parent material classes were represented and include *alluvial*, marine beach, compact *till*, glacial drift, *ablation till*, glacial outwash, volcanic ejecta, *glaciomarine*, marine sediment, organic material, bedrock, sand dunes, *glacial till*, *colluvium*, *loess*, *residuum*, and ice and snow. Frequency percentages were calculated for the above classes by subsection. Frequency data are listed in each subsection description (top 5-ranked classes) and collectively in Appendix I.

Soils: The primary soil type (Soils1) for each CLU unit was used to populate the grid. Soils data were grouped by order and include *Entisols*, *Inceptisols*, *Histosols*, *Spodosols*, and miscellaneous units. Frequency percentages were calculated for the above soil orders by subsection. Frequency data are listed for each subsection (top 5-ranked classes) and collectively in Appendix J. Note: the CLU inventory was conducted prior to the creation of the Andisol (volcanic ash) soil order. This soil order does occur in ash deposits in Southeast Alaska, but has not been mapped to date.

Landcover: The TIMTYP layer was used to populate the grid with landcover data. Sixteen landcover classes were represented and include alder, alpine, brush, cedar, hemlock, hemlock-spruce, ice, lodgepole (shore) pine, landslides, mixed conifer, marsh, other, poplar, rock, spruce, and freshwater. Frequency percentages were calculated for the above classes by subsection. Frequency data are listed in each subsection description (top 5-ranked classes) and collectively in Appendix K.

Productive Forest Land: The TIMTYP layer was used to populate the grid with data on productive forest land. Three classes were designated based on tree cover and growth, and include nonforested (<10% tree cover), nonproductive forests (growing <20 cubic feet/acre/year), and productive forests (growing ≥20 cubic feet/acre/year). Frequency percentages were calculated for the above classes by subsection. Frequency data are listed in each subsection description (in ranked order) and collectively in Appendix L.

Forest Site Index: The CLU layer was used to populate the grid with forest site index data. Forest site index is a measure of forest productivity expressed as the average height of trees at 50 yrs. Four site index classes were represented and include 0-40, 41-60, 61-80, and >80. Frequency percentages were calculated for the above classes by subsection. Frequency data are listed in each subsection description (in ranked order) and collectively in Appendix M.

Forest Harvest: The harvest layer was used to populate the grid with annual forest harvest data. Harvest acres are reported in Appendix N by the following periods: before 1950, 1950-1959, 1960-1969, 1970-1979, 1980-1989, and 1990-1995. Productive forests are lands with tree crown closure ≥10% that produce ≥20 cubic feet of fiber per year. Dividing the total acres harvested by the total acres of productive forests and multiplying this quotient by 100 provides the percentage of productive forests harvested prior to 1995. These data need to be used cautiously because they are incomplete where the land-use designation has changed to preclude logging due to forest plan changes or congressional action. These data were calculated for each subsection and are listed in Appendix N.

Wetlands: The National Wetlands Inventory layer was used to populate the grid with wetland data. A total of 13 classes were represented and include *estuarine subtidal*, *estuarine intertidal*, *lacustrine limnetic*, *lacustrine littoral*, *palustrine aquatic bed*, *palustrine emergent*, *palustrine forested*, *palustrine moss-lichen*, *palustrine scrub-shrub*, *palustrine unconsolidated bottom*, *palustrine unconsolidated shore*, *riverine*, and

upland. Frequency percentages were calculated for the above classes by subsection. These data are listed in each subsection description (top 5-ranked classes) and collectively in Appendix O.

Stream Process Groups: The streams layer prepared by the Tongass National Forest was united with subsection polygons. The resulting cover was then used to summarize miles of *stream process groups* by subsection. Ten *stream process groups* include *alluvial fan streams, estuary streams, flood plain streams, glacial outwash streams, high gradient-contained streams, low gradient-contained streams, moderate gradient-contained streams, moderate gradient-mixed control streams, palustrine streams*, and *lakes*. Data outputs were in miles of *stream process group* per subsection. These data were converted to frequency percentages and are listed in each subsection description (top 5-ranked classes) and collectively in Appendix P.

Land Use Designations: The Modified 1997 Tongass Land and Resource Management Plan (USDA Forest Service 1999) was used to populate the grid. Five major classes of land use include: wilderness and national monument, mostly natural setting, moderate development, intensive development, and private. Frequency percentages were calculated for the above classes by subsection. Frequency data are listed in each subsection description (in ranked order) and collectively in Appendix Q.

Roads: The roads layer captures all roads administered by the U.S. Forest Service along with the major state and city roads occurring within the boundaries of the Tongass National Forest, but does not include roads on private land. By uniting this layer with the subsection cover, total road mileage was estimated per subsection (see Appendix R). Road density was calculated by dividing road miles by square miles of land for each subsection.

Appendix C. Elevation class percentages for 73 ecological subsections of Southeast Alaska.

Subsection Name	0-499'	500-999'	1000-1999'	2000-2999'	3000-3999'	4000-4999'	5000'+
Affleck Canal Till Lowlands	63	30	7	0	0	0	0
Alvin Bay Sediments	60	28	12	1	0	0	0
Behm Canal Complex	16	21	37	21	6	0	0
Bell Island Granitics	15	16	38	23	7	0	0
Berg Bay Complex	39	41	20	0	0	0	0
Boca De Ouadra Complex	34	32	31	2	0	0	0
Boundary Ranges Icefields	5	4	13	20	24	22	13
Cape Fanshaw Complex	39	28	27	6	0	0	0
Central Baranof Metasediments	12	13	31	28	14	2	0
Central POW Till Lowlands	82	16	2	0	0	0	0
Central POW Volcanics	28	26	37	8	0	0	0
Chilkat Complex	16	13	29	26	16	1	0
Chilkat Peninsula Carbonates	19	14	28	24	13	2	0
Clarence Strait Volcanics	51	21	24	3	0	0	0
Dall-Outside Complex	49	28	22	1	0	0	0
Duke Island Till Lowlands	99	1	0	0	0	0	0
Duncan Canal Till Lowlands	65	24	11	1	0	0	0
Eastern Passage Complex	20	18	32	24	6	0	0
Elevenmile Till Lowlands	49	36	15	0	0	0	0
Etolin Granitics	15	15	36	28	5	0	0
Foggy Bay Till Lowlands	92	7	0	0	0	0	0
Freshwater Bay Carbonates	34	23	32	11	0	0	0
Gulf of Esquibel Till Lowlands	80	19	2	0	0	0	0
Hetta Inlet Metasediments	34	25	32	9	0	0	0
Holkham Bay Complex	21	18	32	21	8	1	0
Hood-Gambier Bay Carbonates	38	25	30	7	0	0	0
Kake Volcanics	64	23	12	1	0	0	0
Kasaan Peninsula Volcanics	40	29	28	3	0	0	0
Ketchikan Mafics/Ultramafics	25	24	35	15	0	0	0
Klawock Inlet Till Lowlands	80	14	6	0	0	0	0
Kook Lake Carbonates	34	25	34	6	0	0	0
Kuiu-POW Granitics	25	24	39	11	0	0	0
Misty Fjords Granitics	14	14	28	25	15	5	0
Mitchell-Hasselborg Till Lowlands	71	24	6	0	0	0	0
Moira Sound Complex	41	27	26	5	0	0	0
Mount Edgecumbe Volcanics	67	24	7	1	0	0	0
Necker Bay Granitics	20	20	36	21	3	0	0
North Admiralty Complex	12	18	34	27	9	0	0
North Baranof Complex	33	22	35	10	0	0	0
North Chichagof Granitics	22	22	37	18	1	0	0
North POW-Kuiu Carbonates	66	22	10	2	0	0	0
North POW Complex	47	30	22	1	0	0	0
Outer Coast Wave-cut Terraces	88	9	3	0	0	0	0
Outer Islands Complex	40	35	24	0	0	0	0
Peril Strait Granitics	27	23	40	11	0	0	0
Point Adolphus Carbonates	32	27	33	8	0	0	0
Princess Bay Volcanics	67	29	4	0	0	0	0
Puget Peninsula Metasediments	20	15	32	26	7	0	0
Rowan Sediments	50	25	25	0	0	0	0
Sitka Sound Complex	40	28	28	5	0	0	0
Skowl Arm Till Lowlands	55	26	17	2	0	0	0
Soda Bay Till Lowlands	57	27	16	0	0	0	0
South Admiralty Volcanics	35	21	31	14	1	0	0
South Baranof Sediments	18	23	39	18	2	0	0
South POW Granitics	62	25	13	1	0	0	0
St. Elias-Fairweather Icefields	7	7	25	31	19	8	3
Stephens Passage Glaciomarine Terraces	71	15	12	2	0	0	0
Stephens Passage Volcanics	28	21	35	15	2	0	0
Stikine River Delta	80	10	9	1	0	0	0
Stikine Strait Complex	36	24	32	7	0	0	0
Stikine-Taku River Valleys	69	15	14	2	0	0	0
Sumner Strait Volcanics	55	30	15	0	0	0	0
Thayer Lake Granitics	19	27	36	17	1	0	0
Thomas Bay Outwash Plains	93	7	0	0	0	0	0
Thorne Arm Granitics	48	29	23	0	0	0	0
Traitors Cove Metasediments	34	25	32	9	1	0	0
Ushk-Patterson Bay Granitics	38	31	30	1	0	0	0
Vixen Inlet Till Lowlands	91	9	0	0	0	0	0
Wachusett-Adams Hills	0	96	4	0	0	0	0
West Chichagof Complex	30	27	37	6	0	0	0
Wrangell Narrows Metasediments	39	22	31	7	1	0	0
Yakutat-Lituya Forelands	99	1	0	0	0	0	0
Zimovia Strait Complex	39	24	31	6	0	0	0

Appendix D. Aspect class percentages for 73 ecological subsections of Southeast Alaska.

Subsection Name	N	NE	E	SE	S	SW	W	NW	F
Affleck Canal Till Lowlands	4	16	18	13	14	14	13	8	0
Alvin Bay Sediments	6	16	15	11	12	18	14	10	0
Behm Canal Complex	6	11	14	14	14	12	13	15	1
Bell Island Granitics	6	14	12	12	12	16	14	13	0
Berg Bay Complex	6	11	18	11	13	13	11	18	0
Boca De Quadra Complex	4	13	21	12	9	13	16	13	0
Boundary Ranges Icetields	6	11	12	13	13	15	16	14	0
Cape Fanshaw Complex	6	12	12	13	15	14	15	15	0
Central Baranof Metasediments	8	15	14	13	14	12	11	13	0
Central POW Till Lowlands	6	17	15	10	10	15	15	12	0
Central POW Volcanics	6	14	14	14	12	13	13	13	0
Chilkat Complex	4	10	1	3	6	16	26	33	0
Chilkat Peninsula Carbonates	5	17	19	13	13	13	10	11	0
Clarence Strait Volcanics	5	16	15	12	12	16	15	10	0
Dall-Outside Complex	7	15	14	13	14	12	12	14	0
Duke Island Till Lowlands	6	10	13	15	16	13	13	14	1
Duncan Canal Till Lowlands	6	20	14	9	11	18	12	10	0
Eastern Passage Complex	5	17	12	9	13	18	14	11	0
Elevenmile Till Lowlands	3	11	17	15	15	16	17	9	0
Etolin Granitics	6	15	20	13	11	11	13	11	0
Foggy Bay Till Lowlands	3	8	6	6	11	27	27	12	0
Freshwater Bay Carbonates	7	19	13	10	13	17	10	11	0
Gulf ot Esquibel Till Lowlands	6	15	15	12	9	13	16	13	0
Heffa Inlet Metasediments	6	12	15	13	12	12	15	15	0
Holkham Bay Complex	6	14	11	9	13	17	16	12	0
Hood-Gambier Bay Carbonates	7	14	13	13	13	15	13	12	0
Kake Volcanics	7	12	10	10	16	19	13	13	0
Kasaan Peninsula Volcanics	5	19	15	7	9	20	14	11	0
Ketchikan Mafics/Ultramafics	5	14	13	14	12	14	15	13	0
Klawock Inlet Till Lowlands	7	10	11	13	12	11	19	17	0
Kook Lake Carbonates	7	19	16	12	13	13	8	11	0
Kuiu-POW Granitics	7	13	13	14	14	11	13	15	0
Misty Fjords Granitics	6	12	14	15	11	12	15	15	0
Mitchell-Hasselborg Till Lowlands	5	14	15	15	14	12	11	13	1
Moira Sound Complex	5	14	17	15	12	13	14	10	0
Mount Edgecumbe Volcanics	5	11	18	15	15	9	12	14	0
Necker Bay Granitics	6	7	13	17	12	11	16	17	1
North Admiralty Complex	8	14	12	11	15	14	13	13	0
North Baranof Complex	9	14	14	16	7	7	13	20	0
North Chichagot Granitics	7	17	12	12	11	13	12	15	0
North POW-Kuiu Carbonates	6	13	14	11	11	14	15	15	0
North POW Complex	6	15	15	12	10	10	17	14	0
Outer Coast Wave-cut Terraces	5	9	10	11	12	18	21	15	1
Outer Islands Complex	5	12	13	14	12	11	17	16	0
Peril Strait Granitics	8	14	14	14	13	12	12	12	0
Point Adolphus Carbonates	8	15	13	13	14	12	10	15	0
Princess Bay Volcanics	4	11	20	13	11	16	16	9	0
Puget Peninsula Metasediments	4	17	19	8	10	17	15	11	0
Rowan Sediments	6	14	12	14	13	15	14	12	0
Sitka Sound Complex	6	14	10	10	12	18	15	15	0
Skowl Arm Till Lowlands	7	16	16	13	12	11	11	14	0
Soda Bay Till Lowlands	5	11	14	13	14	14	15	13	0
South Admiralty Volcanics	7	15	10	12	14	15	15	12	0
South Baranot Sediments	7	9	13	22	11	9	12	17	0
South POW Granitics	5	13	13	14	13	14	15	13	0
St. Elias-Fairweather Icetields	5	12	12	11	15	17	15	11	1
Stephens Passage Glaciomarine Terraces	4	19	13	8	9	18	21	9	0
Stephens Passage Volcanics	6	19	18	12	11	15	12	9	0
Stikine River Delta	6	9	8	14	11	10	12	18	11
Stikine Strait Complex	5	13	13	10	11	14	21	13	0
Stikine-Taku River Valleys	6	11	8	11	16	14	11	13	9
Sumner Strait Volcanics	6	11	14	14	14	14	15	13	0
Thayer Lake Granitics	6	10	9	17	11	14	17	14	1
Thomas Bay Outwash Plains	5	12	10	9	12	21	16	9	7
Thorne Arm Granitics	6	13	14	11	15	15	15	12	0
Traitors Cove Metasediments	6	14	14	13	12	15	13	13	0
Ushk-Patterson Bay Granitics	7	20	14	14	14	13	8	9	0
Vixen Inlet Till Lowlands	11	16	7	7	10	15	15	18	0
Wachusett-Adams Hills	7	29	24	8	8	9	8	8	0
West Chichagot Complex	6	10	10	12	16	17	15	13	0
Wrangell Narrows Metasediments	7	15	14	13	12	11	13	14	0
Yakutat-Lituya Forelands	2	4	5	9	18	25	13	6	19
Zimovia Strait Complex	6	16	15	13	11	14	13	12	0

Codes: N = North (337.5° to 22.5°), NE = Northeast (22.5° to 67.5°), E = East (67.5° to 112.5°), SE = Southeast (112.5° to 157.5°), S = South (157.5° to 202.5°), SW = Southwest (202.5° to 247.5°), W = West (247.5° to 292.5°), NW = Northwest (292.5° to 337.5°), and F = Flat (no aspect).

Appendix E. Slope class percentages for 73 ecological subsections of southeast Alaska.

Subsection Name	0-14%	15-34%	35-54%	55-74%	75%+
Affleck Canal Till Lowlands	47	42	9	1	0
Alvin Bay Sediments	36	39	18	6	1
Behm Canal Complex	15	25	28	20	12
Bell Island Granitics	14	26	29	21	10
Berg Bay Complex	15	35	35	11	3
Boca De Quadra Complex	25	38	26	9	2
Boundary Ranges Icefields	26	16	22	20	16
Cape Fanshaw Complex	34	35	21	8	2
Central Baranof Metasediments	9	17	27	25	21
Central POW Till Lowlands	75	22	3	0	0
Central POW Volcanics	32	36	21	8	2
Chilkat Complex	12	20	32	23	12
Chilkat Peninsula Carbonates	20	27	27	18	8
Clarence Strait Volcanics	41	26	18	11	4
Dall-Outside Complex	27	34	23	12	4
Duke Island Till Lowlands	95	4	1	0	0
Duncan Canal Till Lowlands	75	17	6	2	0
Eastern Passage Complex	15	30	31	17	6
Elevenmile Till Lowlands	61	32	6	1	0
Etolin Granitics	12	22	34	23	10
Foggy Bay Till Lowlands	83	16	1	0	0
Freshwater Bay Carbonates	28	29	24	14	5
Gulf of Esquibel Till Lowlands	66	29	5	0	0
Hetta Inlet Metasediments	23	33	25	14	5
Holkham Bay Complex	14	29	31	18	8
Hood-Gambier Bay Carbonates	28	33	24	12	4
Kake Volcanics	69	23	7	1	0
Kasaan Peninsula Volcanics	31	36	23	9	2
Ketchikan Mafics/Ultramafics	19	31	27	15	8
Klawock Inlet Till Lowlands	56	31	8	3	0
Kook Lake Carbonates	22	29	27	17	5
Kuiu-POW Granitics	10	24	33	24	9
Misty Fjords Granitics	10	19	26	24	20
Mitchell-Hasselborg Till Lowlands	69	26	4	1	0
Moira Sound Complex	27	35	21	11	6
Mount Edgecumbe Volcanics	74	18	5	2	0
Necker Bay Granitics	10	17	27	27	19
North Admiralty Complex	12	28	32	20	8
North Baranof Complex	19	30	29	17	7
North Chichagof Granitics	16	31	29	17	7
North POW-Kuiu Carbonates	52	35	10	3	1
North POW Complex	40	39	15	5	1
Outer Coast Wave-cut Terraces	63	25	8	2	1
Outer Islands Complex	19	32	28	16	5
Peril Strait Granitics	19	32	31	15	3
Point Adolphus Carbonates	30	35	24	9	2
Princess Bay Volcanics	62	30	7	1	0
Puget Peninsula Metasediments	14	22	28	26	10
Rowan Sediments	34	35	24	6	1
Sitka Sound Complex	25	35	24	12	4
Skowl Arm Till Lowlands	50	34	10	4	1
Soda Bay Till Lowlands	46	35	14	4	0
South Admiralty Volcanics	26	28	22	16	8
South Baranof Sediments	12	18	26	24	20
South POW Granitics	47	33	14	6	1
St. Elias-Fairweather Icefields	43	19	18	13	8
Stephens Passage Glaciomarine Terraces	59	26	10	4	1
Stephens Passage Volcanics	19	35	28	12	6
Stikine River Delta	58	21	14	6	1
Stikine Strait Complex	30	34	23	11	3
Stikine-Taku River Valleys	56	12	14	10	7
Sumner Strait Volcanics	60	30	9	2	0
Thayer Lake Granitics	29	31	26	12	2
Thomas Bay Outwash Plains	75	18	6	1	0
Thorne Arm Granitics	41	31	19	8	1
Traitors Cove Metasediments	27	33	23	12	4
Ushk-Patterson Bay Granitics	23	37	28	11	2
Vixen Inlet Till Lowlands	90	10	0	0	0
Wachusett-Adams Hills	87	7	5	1	0
West Chichagof Complex	19	31	28	15	7
Wrangell Narrows Metasediments	34	30	23	11	2
Yakutat-Lituya Forelands	97	2	1	0	0
Zimovia Strait Complex	30	38	23	8	2

Appendix F. Topographic roughness statistics for 82 ecological subsections of Southeast Alaska.

Subsection Name	Mean	Standard Deviation	Minimum	Maximum	Range	Topographic Roughness Class
Affleck Canal Till Lowlands	32	20.7	0	144	144	Rolling
Alsek-Tatshenshini River Valleys	23	39	0	222	222	Rolling
Alvin Bay Sediments	43	29.3	0	263	263	Rough
Behm Canal Complex	74	42.4	0	331	331	Very Rough
Bell Island Granitics	72	39.4	0	329	329	Very Rough
Berg Bay Complex	56	37.4	0	296	296	Rough
Berg-Beardslee Moraine	6	8	0	105	105	Smooth
Boca De Quadra Complex	51	30.1	0	209	209	Rough
Boundary Ranges Icefields	76	92.9	0	5330	5330	Very Rough
Cape Fanshaw Complex	47	32.6	0	293	293	Rough
Cape Spencer Complex	65	43.2	0	223	223	Very Rough
Central Baranof Metasediments	91	46.1	0	399	399	Extremely Rough
Central POW Till Lowlands	19	16	0	138	138	Smooth
Central POW Volcanics	47	32.3	0	291	291	Rough
Chilkat Complex	70	81.3	0	2266	2266	Very Rough
Chilkat Peninsula Carbonates	72	40.7	0	337	337	Very Rough
Chilkat River Valley	9	16.6	0	132	132	Smooth
Clarence Strait Volcanics	47	38.3	0	247	247	Rough
Dall-Outside Complex	54	35.5	0	372	372	Rough
Duke Island Till Lowlands	9	13.2	0	189	189	Smooth
Duncan Canal Till Lowlands	20	22.1	0	172	172	Rolling
Dundas Bay Granitics	73	43.9	0	296	296	Very Rough
Dundas River Flats	6	13.8	0	157	157	Smooth
Eastern Passage Complex	66	36.5	0	329	329	Very Rough
Elevenmile Till Lowlands	26	20.5	0	171	171	Rolling
Etolin Granitics	76	37.4	0	250	250	Very Rough
Fairweather Front Range Complex	63	37.7	0	203	203	Very Rough
Foggy Bay Till Lowlands	16	13.3	0	117	117	Smooth
Freshwater Bay Carbonates	56	38.3	0	280	280	Rough
Gulf of Esquibel Till Lowlands	24	17	0	145	145	Rolling
Gustavus Flats	3	9.4	0	127	127	Smooth
Hetta Inlet Metasediments	59	37.2	0	361	361	Rough
Holkham Bay Complex	68	35.7	0	336	336	Very Rough
Hood-Gambier Bay Carbonates	53	35	0	267	267	Rough
Kake Volcanics	23	21.7	0	188	188	Rolling
Kasaan Peninsula Volcanics	48	31.3	0	227	227	Rough
Ketchikan Mafics Ultramafics	65	38.9	0	265	265	Very Rough
Klawock Inlet Till Lowlands	30	24.5	0	152	152	Rolling
Kook Lake Carbonates	61	37.9	0	280	280	Very Rough
Kuiu-POW Granitics	76	35.6	0	520	520	Very Rough
Misty Fjords Granitics	87	46.2	0	529	529	Extremely Rough
Mitchell-Hasselborg Till Lowlands	22	18.9	0	147	147	Rolling
Moira Sound Complex	55	37.9	0	299	299	Rough
Mount Edgecumbe Volcanics	21	21.5	0	153	153	Rolling
Necker Bay Granitics	88	42.3	0	413	413	Extremely Rough
North Admiralty Complex	71	37.1	0	292	292	Very Rough
North Baranof Complex	64	37.3	0	271	271	Very Rough
North Chichagof Granitics	65	37.2	0	648	648	Very Rough
North POW-Kuiu Carbonates	32	26.4	0	329	329	Rolling
North POW Complex	39	27.8	0	262	262	Rolling
Outer Coast Wave-cut Terraces	28	25.4	0	231	231	Rolling
Outer Islands Complex	63	36	0	259	259	Very Rough
Peril Strait Granitics	60	33.5	0	290	290	Very Rough
Point Adolphus Carbonates	49	31.7	0	259	259	Rough
Princess Bay Volcanics	27	21.9	0	203	203	Rolling
Puget Peninsula Metasediments	74	38.4	0	294	294	Very Rough
Rowan Sediments	44	28.9	0	171	171	Rough
Salmon River Sediments	20	12.4	0	96	96	Rolling
Sitka Sound Complex	55	35	0	255	255	Rough
Skowl Arm Till Lowlands	35	28.5	0	216	216	Rolling
Soda Bay Till Lowlands	37	26.9	0	201	201	Rolling
South Admiralty Volcanics	61	40.9	0	257	257	Very Rough
South Baranof Sediments	87	45.9	0	335	335	Extremely Rough
South POW Granitics	38	30.8	0	262	262	Rolling
St. Elias-Fairweather Icefields	57	71.3	0	4687	4687	Rough
Stephens Passage Glaciomarine Terraces	30	29.1	0	223	223	Rolling
Stephens Passage Volcanics	60	35.7	0	299	299	Very Rough
Stikine River Delta	32	33.6	0	156	156	Rolling
Stikine Strait Complex	51	34.4	0	241	241	Rough
Stikine-Taku River Valleys	48	71.1	0	1793	1793	Rough
Sumner Strait Volcanics	27	22.8	0	189	189	Rolling
Thayer Lake Granitics	52	33.9	0	188	188	Rough
Thomas Bay Outwash Plains	19	22.4	0	185	185	Smooth
Thorne Arm Granitics	42	31.3	0	164	164	Rough
Traitors Cove Metasediments	54	35.4	0	424	424	Rough
Ushk-Patterson Bay Granitics	54	31.5	0	266	266	Rough
Vixen Inlet Till Lowlands	12	9.7	0	93	93	Smooth
Wachusett-Adams Hills	33	31.6	0	196	196	Rolling
West Chichagof Complex	64	37.2	0	290	290	Very Rough
Wrangell Narrows Metasediments	49	34.7	0	295	295	Rough
Yakutat-Lituya Forelands	4	10	0	184	184	Smooth
Zimovia Strait Complex	48	30.4	0	227	227	Rough

Topographic roughness classes were formed for descriptive purposes using mean values: 0-19 = smooth, 20-39 = rolling, 40-59 = rough, 60-79 = very rough, and 80+ = extremely rough.

Appendix G. Annual precipitation statistics for 85 ecological subsections of Southeast Alaska.

Subsection Name	Mean	Standard Deviation	Minimum	Maximum	Range	Precipitation Class
Affleck Canal Till Lowlands	127	20	85	190	105	Moderately High
Alsek-Tatshenshini River Valleys	56	25	40	160	120	Moderate
Alvin Bay Sediments	112	13	90	182	93	Moderately High
Behm Canal Complex	167	23	120	220	100	High
Bell Island Granitics	122	22	80	160	80	Moderately High
Berg Bay Complex	112	14	77	134	57	Moderately High
Berg-Beardslee Moraine	83	19	60	126	66	Moderate
Boca De Quadra Complex	137	12	103	163	60	Moderately High
Boundary Ranges Icefields	177	42	40	260	220	High
Cape Fanshaw Complex	107	12	60	121	61	Moderately High
Cape Spencer Complex	119	14	80	152	72	Moderately High
Central Baranof Metasediments	187	27	101	300	199	High
Central POW Till Lowlands	100	12	60	134	74	Moderately High
Central POW Volcanics	123	16	70	160	90	Moderately High
Chilkat Complex	65	23	40	140	100	Moderate
Chilkat Peninsula Carbonates	130	27	60	176	116	Moderately High
Chilkat River Valley	44	8	40	71	31	Low
Clarence Strait Volcanics	121	30	60	200	140	Moderately High
Dall-Outside Complex	134	25	80	200	120	Moderately High
Duke Island Till Lowlands	110	8	80	139	59	Moderately High
Duncan Canal Till Lowlands	101	10	65	120	55	Moderately High
Dundas Bay Granitics	123	12	80	145	65	Moderately High
Dundas River Flats	127	11	77	155	78	Moderately High
Eastern Passage Complex	120	17	81	180	99	Moderately High
Elevenmile Till Lowlands	109	7	98	132	34	Moderately High
Etolin Granitics	129	17	90	160	70	Moderately High
Fairweather Front Range Complex	132	14	96	152	56	Moderately High
Foggy Bay Till Lowlands	114	8	99	150	51	Moderately High
Freshwater Bay Carbonates	104	14	62	120	58	Moderately High
Gulf of Esquibel Till Lowlands	103	6	83	120	37	Moderately High
Gustavus Flats	75	26	60	150	90	Moderate
Hetta Inlet Metasediments	135	21	80	180	100	Moderately High
Holkham Bay Complex	126	29	60	181	121	Moderately High
Hood-Gambier Bay Carbonates	93	17	60	120	60	Moderate
Hugh Miller-Geikie Inlet Mountains	130	11	101	174	73	Moderately High
Kake Volcanics	91	17	60	120	60	Moderate
Kasaan Peninsula Volcanics	95	8	76	100	24	Moderate
Ketchikan Mafics/Ultramafics	153	44	72	240	168	High
Klawock Inlet Till Lowlands	113	4	100	120	20	Moderately High
Kook Lake Carbonates	95	6	72	100	28	Moderate
Kuiu-POW Granitics	141	19	90	200	110	Moderately High
Misty Fjords Granitics	164	23	100	200	100	High
Mitchell-Hasselborg Till Lowlands	86	12	60	110	50	Moderate
Moira Sound Complex	144	22	80	180	100	Moderately High
Mount Edgecumbe Volcanics	130	22	81	200	119	Moderately High
Necker Bay Granitics	181	28	122	300	178	High
North Admiralty Complex	100	15	60	140	80	Moderately High
North Baranof Complex	131	22	100	180	80	Moderately High
North Chichagof Granitics	139	26	80	180	100	Moderately High
North POW-Kuiu Carbonates	105	14	60	140	80	Moderately High
North POW Complex	110	11	80	140	60	Moderately High
Outer Coast Wave-cut Terraces	128	13	89	179	90	Moderately High
Outer Islands Complex	110	14	80	140	60	Moderately High
Peril Strait Granitics	106	10	75	140	65	Moderately High
Point Adolphus Carbonates	101	13	65	120	55	Moderately High
Princess Bay Volcanics	132	12	120	160	40	Moderately High
Puget Peninsula Metasediments	169	14	126	200	74	High
Queen-Tidal Inlet Mountains	129	9	103	153	50	Moderately High
Rowan Sediments	116	14	63	160	97	Moderately High
Salmon River Sediments	77	7	63	103	39	Moderate
Sitka Sound Complex	141	14	81	180	99	Moderately High
Skowl Arm Till Lowlands	102	12	80	140	60	Moderately High
Soda Bay Till Lowlands	119	5	100	140	40	Moderately High
South Admiralty Volcanics	107	16	60	140	80	Moderately High
South Baranof Sediments	235	63	98	400	302	Very High
South POW Granitics	141	32	82	200	118	Moderately High
St. Elias-Fairweather Icefields	156	45	40	260	220	High
Stephens Passage Glaciomarine Terraces	79	16	60	127	67	Moderate
Stephens Passage Volcanics	81	20	60	120	60	Moderate
Stikine River Delta	93	15	80	142	62	Moderate
Stikine Strait Complex	104	8	80	120	40	Moderately High
Stikine-Taku River Valleys	128	37	60	194	134	Moderately High
Sumner Strait Volcanics	107	14	67	160	93	Moderately High
Thayer Lake Granitics	93	15	60	120	60	Moderate
Thomas Bay Outwash Plains	95	16	80	151	71	Moderate
Thorne Arm Granitics	133	16	102	160	58	Moderately High
Traitors Cove Metasediments	117	18	80	160	80	Moderately High
Upper West Arm Mountains	131	17	120	181	61	Moderately High
Ushk-Patterson Bay Granitics	121	12	100	149	49	Moderately High
Vixen Inlet Till Lowlands	92	9	69	110	41	Moderate
Wachusett-Adams Hills	144	10	93	169	76	Moderately High
West Chichagof Complex	145	10	104	160	56	Moderately High
Wrangell Narrows Metasediments	115	15	80	140	60	Moderately High
Yakutat-Lituya Forelands	122	21	80	171	91	Moderately High
Zimovia Strait Complex	100	6	76	128	52	Moderately High

Five annual precipitation classes were formed for descriptive purposes using mean values: <50" = low, 50-99" = moderate, 100-149" = moderately high, 150-199" = high, 200"+ = very high.

Appendix H. Landform association percentages for 64 ecological subsections of Southeast Alaska.

Subsection Name	Mountain Summits	Mountain Slopes	Hills	Valley Floor	Lowlands	Coastal	Volcanic	Percent GRID reporting data
Affleck Canal Till Lowlands	0	22	8	1	68	0	0	98
Alvin Bay Sediments	1	46	10	5	39	0	0	97
Behm Canal Complex	36	50	7	7	0	0	0	29
Bell Island Granitics	23	66	2	3	6	0	0	82
Berg Bay Complex	15	46	36	2	0	1	0	99
Boundary Ranges Icefields	79	16	0	4	0	0	0	60
Cape Fanshaw Complex	3	55	9	7	23	1	0	99
Central Baranof Metasediments	56	35	1	6	2	0	0	78
Central POW Till Lowlands	0	13	67	10	6	3	0	53
Central POW Volcanics	10	42	24	22	2	1	0	48
Chilkat Complex	56	29	4	11	1	0	0	97
Chilkat Peninsula Carbonates	31	43	5	10	10	1	0	74
Clarence Strait Volcanics	6	42	16	16	17	2	0	55
Dall-Outside Complex	8	73	8	7	0	4	0	69
Duke Island Till Lowlands	0	96	0	1	0	2	0	68
Duncan Canal Till Lowlands	1	24	6	4	64	1	0	99
Eastern Passage Complex	22	58	5	4	9	0	0	97
Elevenmile Till Lowlands	0	47	32	15	3	3	0	71
Etolin Granitics	30	47	4	2	17	0	0	97
Freshwater Bay Carbonates	7	56	5	15	16	1	0	93
Gulf of Esquibel Till Lowlands	0	69	12	7	0	12	0	91
Hetta Inlet Metasediments	19	64	8	8	0	1	0	60
Holkham Bay Complex	15	68	2	10	4	0	0	77
Kake Volcanics	1	26	15	15	42	2	0	99
Kasaan Peninsula Volcanics	0	67	18	15	1	0	0	52
Ketchikan Matics/Ultramatics	32	55	4	9	0	0	0	71
Klawock Inlet Till Lowlands	1	41	14	17	2	25	0	38
Kook Lake Carbonates	8	60	2	15	14	0	0	99
Kuiu-POW Granitics	17	57	8	9	8	0	0	71
Misty Fjords Granitics	43	48	0	7	1	1	0	4
Moira Sound Complex	14	64	9	12	0	1	0	69
Mount Edgecumbe Volcanics	0	11	1	0	5	4	79	99
Necker Bay Granitics	50	34	9	5	2	0	0	16
North Admiralty Complex	7	78	1	11	3	0	0	14
North Baranof Complex	9	72	3	10	6	1	0	99
North Chichagof Granitics	28	54	4	7	7	1	0	82
North POW-Kuiu Carbonates	6	13	60	13	8	1	0	25
North POW Complex	3	1	80	16	0	0	0	45
Outer Coast Wave-cut Terraces	0	8	66	2	16	8	0	22
Peril Strait Granitics	14	62	3	10	10	0	0	99
Point Adolphus Carbonates	5	62	4	15	13	1	0	73
Princess Bay Volcanics	0	69	8	22	0	0	0	37
Rowan Sediments	1	59	5	12	22	0	0	99
Sitka Sound Complex	4	78	3	7	8	1	0	96
Skowl Arm Till Lowlands	10	75	12	2	0	0	0	74
Soda Bay Till Lowlands	4	69	12	10	0	5	0	66
South Baranof Sediments	65	24	8	2	1	1	0	65
South POW Granitics	9	57	15	18	0	1	0	55
St. Elias-Fairweather Icefields	84	11	1	3	1	0	0	13
Stephens Passage Glaciomarine Terraces	8	34	21	13	23	1	0	56
Stephens Passage Volcanics	36	47	3	9	5	0	0	27
Stikine River Delta	8	18	44	7	3	19	0	60
Stikine Strait Complex	6	45	8	2	39	0	0	99
Stikine-Taku River Valleys	16	36	6	23	18	2	0	72
Sumner Strait Volcanics	2	30	5	4	57	2	0	99
Thomas Bay Outwash Plains	0	24	6	20	44	5	0	95
Thorne Arm Granitics	7	80	6	8	0	0	0	60
Traitors Cove Metasediments	11	66	10	13	0	1	0	83
Ushk-Patterson Bay Granitics	8	70	2	13	5	1	0	87
Vixen Inlet Till Lowlands	0	50	13	33	0	4	0	98
West Chichagof Complex	22	68	0	5	4	0	0	8
Wrangell Narrows Metasediments	4	47	8	7	33	0	0	99
Yakutat-Lituya Forelands	0	1	0	11	76	11	0	76
Zimovia Strait Complex	3	47	8	3	39	0	0	94

The primary landform (LF1) data item in the common land unit (CLU) data layer was queried in GIS. The following codes were grouped to generate landform association percentages: Mountain Summits = 10, 11, 12, 13 & 21; Mountain Slopes = 30, 31, 32, 33, 35, 36 & 37; Hills = 40, 42, 43, 44 & 45; Valley Bottom = 51, 52, 53 & 54; Lowlands = 60, 61, 62, 63 & 64; Coastal = 71, 72, 73 & 74; and Volcanic = 81, 82, 83, 84, 85, 86, 87 & 88.

Appendix I. Parent material percentages for 64 ecological subsections of Southeast Alaska.

Subsection Name	A	MB	CT	GD	AT	GO	VE	G	MS	OM	B	SD	GT	C	L	R	IS	GRID
Atlleck Canal Till Lowlands	0	0	16	15	34	0	0	0	0	0	0	0	0	16	0	17	0	45
Alvin Bay Sediments	1	0	5	6	26	0	0	0	0	0	0	0	0	38	0	24	0	73
Behm Canal Complex	4	0	1	0	0	0	0	0	0	28	7	0	0	43	0	18	0	26
Bell Island Granitics	1	0	1	1	2	0	0	0	0	32	9	0	2	10	0	43	0	72
Berg Bay Complex	0	1	0	0	0	0	0	0	0	14	15	0	5	65	0	0	0	97
Boundary Ranges Icelields	3	0	0	1	0	0	0	0	0	4	46	0	0	9	0	19	18	49
Cape Fanshaw Complex	2	1	17	4	7	0	0	0	0	6	0	0	0	18	0	45	0	83
Central Baranot Metasediments	5	0	0	0	0	0	4	0	0	7	49	0	0	16	0	14	4	78
Central POW Till Lowlands	3	1	16	0	0	0	0	0	0	79	0	0	0	0	0	1	0	48
Central POW Volcanics	7	1	30	0	0	0	0	0	0	47	6	0	0	8	0	1	0	46
Chitkat Complex	5	0	0	0	0	0	0	0	0	1	71	0	0	22	0	0	1	97
Chitkat Peninsula Carbonates	6	0	4	0	0	0	0	0	0	14	26	0	0	29	0	20	1	72
Clarence Strait Volcanics	3	1	8	7	10	0	0	0	0	17	0	0	0	21	0	33	0	40
Dall-Outside Complex	2	3	11	1	1	0	0	0	0	17	1	0	0	49	0	15	0	58
Duke Island Till Lowlands	1	2	0	0	0	0	0	0	0	93	0	0	2	0	0	1	0	68
Duncan Canal Till Lowlands	3	2	17	17	11	0	0	2	0	0	0	0	0	25	0	22	0	44
Eastern Passage Complex	2	0	2	1	6	0	0	0	0	0	3	0	0	14	0	70	0	85
Elevenmile Till Lowlands	1	3	28	0	0	0	0	0	0	69	0	0	0	0	0	0	0	67
Etolin Granitics	1	0	3	4	11	0	0	0	0	0	11	0	0	10	0	59	0	85
Freshwater Bay Carbonates	8	0	13	0	0	0	0	0	0	14	4	0	0	27	0	34	0	93
Gult ot Esquibel Till Lowlands	1	8	31	1	0	0	0	0	0	15	0	0	0	44	0	0	0	87
Hetta Inlet Metasediments	2	0	15	0	0	0	0	0	0	17	3	0	0	45	0	17	0	56
Holkham Bay Complex	5	0	3	0	0	0	0	0	0	14	9	0	0	23	0	45	0	74
Kake Volcanics	2	2	8	7	10	0	0	11	0	0	0	0	0	43	0	17	0	66
Kasaan Peninsula Volcanics	0	0	47	0	0	0	0	0	0	53	0	0	0	0	0	0	0	49
Ketchikan Mafics/Ultramatics	2	0	4	2	1	0	0	0	0	20	14	0	0	17	0	39	0	61
Klawock Inlet Till Lowlands	16	16	41	0	0	0	0	0	0	23	1	0	0	3	0	0	0	33
Kook Lake Carbonates	10	0	10	0	0	0	0	1	0	9	2	0	0	27	0	41	0	99
Kuiu-POW Granitics	2	0	2	2	7	0	0	0	0	8	4	0	0	18	0	56	0	68
Misty Fjords Granitics	2	1	0	1	0	0	0	0	0	8	5	0	0	9	0	74	0	4
Moira Sound Complex	1	0	5	1	0	0	0	0	0	38	8	0	2	32	0	13	0	62
Mount Edgecumbe Volcanics	5	0	0	0	0	0	53	0	0	25	0	1	0	12	0	4	0	20
Necker Bay Granitics	3	0	0	0	0	0	1	0	0	19	55	0	0	20	0	1	0	16
North Admiralty Complex	3	0	10	0	0	0	0	0	0	11	6	0	0	24	0	47	0	14
North Baranot Complex	9	0	11	0	0	0	6	0	0	8	3	0	0	23	0	41	0	99
North Chichagot Granitics	6	0	2	0	0	0	0	0	0	14	26	0	0	19	0	32	0	81
North POW-Kuiu Carbonates	2	1	5	0	1	0	0	0	0	60	6	0	0	6	0	19	0	23
North POW Complex	1	0	0	0	0	0	0	0	0	96	3	0	0	0	0	0	0	44
Outer Coast Wave-cut Terraces	1	0	1	0	0	0	10	0	0	62	1	0	9	13	0	3	0	18
Peril Strait Granitics	6	0	12	0	0	0	1	0	0	15	10	0	0	20	0	36	0	98
Point Adolphus Carbonates	10	0	6	0	0	0	0	1	0	15	1	0	0	29	0	39	0	73
Princess Bay Volcanics	1	0	0	0	0	0	0	0	0	15	0	0	0	57	0	28	0	28
Rowan Sediments	2	0	3	4	8	0	0	1	0	0	0	0	0	40	0	42	0	87
Sitka Sound Complex	4	0	0	0	0	0	58	0	0	16	3	0	0	9	0	11	0	96
Skowl Arm Till Lowlands	1	0	24	0	0	0	0	0	0	25	1	0	0	40	0	9	0	64
Soda Bay Till Lowlands	3	5	28	0	2	0	0	0	0	19	0	0	0	39	0	5	0	55
South Baranot Sediments	1	0	0	0	0	0	0	0	0	8	71	0	1	18	0	0	0	63
South POW Granitics	2	0	12	6	1	0	0	0	0	32	3	0	0	30	0	14	0	48
St. Elias-Fairweather Icetields	2	0	0	0	0	1	0	0	0	14	54	0	0	8	0	4	17	13
Stephens Passage Glaciomarine Terraces	6	0	10	0	0	2	0	0	0	28	9	0	1	38	0	5	0	53
Stephens Passage Volcanics	1	0	0	0	0	0	0	0	0	8	36	0	1	54	0	0	0	27
Stikine River Delta	7	19	5	0	0	0	0	0	0	2	5	0	0	5	43	14	0	60
Stikine Strait Complex	1	0	11	7	23	0	0	0	0	0	2	0	0	18	0	38	0	68
Stikine-Taku River Valleys	22	0	0	0	0	7	0	0	2	11	10	0	0	16	0	32	1	71
Sumner Strait Volcanics	4	4	8	8	19	0	0	1	0	0	0	0	0	27	0	29	0	49
Thomas Bay Outwash Plains	14	7	6	4	17	15	0	0	0	0	1	0	0	20	0	15	0	70
Thorne Arm Granitics	2	0	0	0	0	0	0	0	0	28	2	0	0	53	0	15	0	52
Traitors Cove Metasediments	3	0	3	4	0	0	0	0	0	28	1	0	1	26	0	35	0	68
Ushk-Patterson Bay Granitics	9	0	4	0	0	0	18	0	0	22	3	0	0	19	0	25	0	87
Vixen Inlet Till Lowlands	10	4	35	4	1	0	0	0	0	35	0	0	0	6	0	7	0	81
West Chichagot Complex	6	0	0	0	0	0	8	0	0	7	20	0	0	19	0	42	0	8
Wrangell Narrows Metasediments	1	1	7	4	10	0	0	2	0	0	0	0	0	37	0	38	0	75
Yakutat-Lituya Forelands	47	3	0	0	0	17	0	0	1	23	2	7	0	1	0	0	0	15
Zimovia Strait Complex	1	0	10	9	18	0	0	0	0	5	0	0	0	28	0	28	0	65

Codes: A = Alluvial, MB = Marine Beach, CT = Compact Till, GD = Glacial Drift, AT = Ablation Till, GO = Glacial Outwash, VE = Volcanic Ejecta, G = Glaciomarine, MS = Marine Sediments, OM = Organic Materials, B = Bedrock, SD = Sand Dunes, GT = Glacial Till, C = Colluvium, L = Loess, R = Residuum, IS = Ice & Snow, and GRID = Percent of the GRID reporting data.

The primary parent material (PM1) data item in the common land unit (CLU) data layer was queried in GIS to generate parent material percentages.

Appendix J. Soils percentages for 64 ecological subsections of Southeast Alaska.

Subsection Name	Entisols	Inceptisols	Histosols	Spodosols	Miscellaneous	Percent GRID reporting data
Affleck Canal Till Lowlands	0	0	68	32	0	98
Alvin Bay Sediments	1	1	35	63	0	97
Behm Canal Complex	3	10	17	63	7	29
Bell Island Granitics	1	4	45	41	8	82
Berg Bay Complex	1	15	42	42	0	97
Boundary Ranges Icefields	3	10	14	10	63	60
Cape Fanshaw Complex	1	3	42	54	0	99
Central Baranof Metasediments	7	12	6	27	48	78
Central POW Till Lowlands	3	1	81	16	0	53
Central POW Volcanics	7	1	50	37	6	48
Chilkat Complex	5	26	39	14	16	97
Chilkat Peninsula Carbonates	13	10	16	36	25	72
Clarence Strait Volcanics	2	11	44	43	0	55
Dall-Outside Complex	2	7	28	60	3	69
Duke Island Till Lowlands	1	4	93	1	0	68
Duncan Canal Till Lowlands	2	1	69	28	0	99
Eastern Passage Complex	1	7	37	50	4	97
Elevenmile Till Lowlands	1	2	71	26	0	71
Etolin Granitics	1	7	44	39	10	97
Freshwater Bay Carbonates	10	7	23	57	4	93
Gulf of Esquibel Till Lowlands	1	8	19	72	0	91
Hetta Inlet Metasediments	2	7	21	67	3	60
Holkham Bay Complex	4	11	17	59	9	76
Kake Volcanics	2	0	43	55	0	99
Kasaan Peninsula Volcanics	0	0	56	44	0	52
Ketchikan Mafics Ultramafics	2	18	25	41	14	71
Klawock Inlet Till Lowlands	14	14	32	39	1	38
Kook Lake Carbonates	5	10	16	67	2	99
Kuiu-POW Granitics	1	8	32	54	5	71
Misty Fjords Granitics	2	8	49	32	9	4
Moira Sound Complex	1	9	42	40	7	69
Mount Edgecumbe Volcanics	2	14	25	59	0	20
Necker Bay Granitics	1	22	34	17	26	16
North Admiralty Complex	5	11	11	67	6	14
North Baranof Complex	5	11	13	68	3	99
North Chichagof Granitics	5	11	20	45	19	81
North POW-Kuiu Carbonates	2	1	63	29	6	25
North POW Complex	1	0	95	0	4	45
Outer Coast Wave-cut Terraces	0	9	70	20	0	18
Peril Strait Granitics	3	10	26	58	3	98
Point Adolphus Carbonates	10	9	19	61	1	73
Princess Bay Volcanics	0	3	34	62	0	37
Rowan Sediments	1	1	20	78	0	99
Sitka Sound Complex	2	4	16	76	3	96
Skowl Arm Till Lowlands	1	1	35	62	1	74
Soda Bay Till Lowlands	2	7	33	58	0	66
South Baranof Sediments	1	28	34	9	27	63
South POW Granitics	3	13	41	40	3	55
St. Elias-Fairweather Icefields	6	14	1	6	73	13
Stephens Passage Glaciomarine Terraces	4	7	45	44	1	53
Stephens Passage Volcanics	0	17	36	46	0	27
Stikine River Delta	19	46	11	16	9	60
Stikine Strait Complex	0	1	49	47	1	99
Stikine-Taku River Valleys	23	17	23	33	3	72
Sumner Strait Volcanics	2	0	61	37	0	99
Thomas Bay Outwash Plains	10	0	34	53	3	95
Thorne Arm Granitics	2	1	37	59	2	60
Traitors Cove Metasediments	3	10	35	50	1	83
Ushk-Patterson Bay Granitics	3	12	25	58	3	87
Vixen Inlet Till Lowlands	8	8	46	38	0	98
West Chichagof Complex	5	10	7	58	20	8
Wrangell Narrows Metasediments	1	4	41	54	0	99
Yakutat-Lituya Forelands	50	3	24	15	8	15
Zimovia Strait Complex	0	1	51	47	0	94

The primary soil (SOIL1) data item in the common land unit (CLU) data layer was queried in GIS. The following codes were grouped to generate soil order percentages:
Entisols = BRA, BRAV, E, EACG, EACT, EAHG, EFCGC, EFCT, EFCTC, EOCG, EOCL, EPCT, GOL, TON, TONV, WAT.
Inceptisols = CHR, HEL, HOF, IACA, IACG, IACH, IACT, IUCE, IUCL, IUCT, LIE, MAG, MEA, PET, SAL, SHA, SHAS, SOM.
Histosols = SUN, MAY, GRI, H, HFCTR, HFCTY, HHCG, HHCT, HSCG, HSCL, HYD, KAH, KAI, KIN, KOG, KUS, MCG, MOI, NAK, SPA, STA.
Spodosols = BAR, BLA, CAL, CALC, FAN, FOA, GUN, ISI, KAS, KASC KAT, KUP, KWA, MIT, MOS, NAU, PAR, REM, SACG, SACL, SACT, SAHP, SAR, SIT, SITC, SLO, SOCC, SOCH, SOCHC, SOCHL, SOCL, STN, STNC, SUK, SUKC, TOK, TOL, TOLC, TRA, TUX, ULL, ULLC, VER, VIX, WAD, YAB.
Miscellaneous units = GD, ICE, IS, LC, LS, LT, RO, RW, SAND, TS.

Appendix K. Landcover percentages for 73 ecological subsections of Southeast Alaska.

Subsection Name	A	Alp	B	C	H	HS	I	LP	L	MC	M	O	P	R	S	W	GRID
Affleck Canal Till Lowlands	26	0	1	0	36	13	0	8	0	15	0	0	0	0	1	0	100
Alvin Bay Sediments	9	0	2	0	50	22	0	7	1	8	0	0	0	0	0	0	100
Behm Canal Complex	0	25	7	0	26	14	0	9	2	2	0	14	0	2	0	0	100
Bell Island Granitics	0	26	5	0	34	8	0	7	2	5	0	10	0	1	0	1	100
Berg Bay Complex	3	2	7	0	4	67	0	0	0	7	1	3	0	0	6	0	100
Boca De Ouadra Complex	0	1	1	0	37	7	0	21	0	28	0	3	0	0	0	0	100
Boundary Ranges Icefields	0	77	5	0	4	2	2	0	3	1	0	2	0	2	0	0	100
Cape Fanshaw Complex	0	4	2	0	37	28	0	3	1	18	1	3	0	0	1	0	100
Central Baranof Metasediments	1	47	6	0	4	11	0	0	10	2	0	8	0	10	1	0	100
Central POW Till Lowlands	0	0	9	2	30	17	0	12	0	17	3	10	0	0	1	0	100
Central POW Volcanics	0	7	5	1	25	21	0	8	1	11	1	13	0	7	1	0	100
Chilkat Complex	0	39	7	0	6	12	0	0	2	10	0	2	0	15	4	2	100
Chilkat Peninsula Carbonates	0	41	14	0	14	10	0	5	4	3	0	5	0	1	3	0	100
Clarence Strait Volcanics	1	2	39	0	22	12	0	7	1	12	0	3	0	0	0	1	100
Dall-Outside Complex	0	2	28	0	33	12	0	5	1	12	1	3	0	1	1	0	100
Duke Island Till Lowlands	0	0	30	2	5	6	0	28	0	26	3	0	0	0	0	0	100
Duncan Canal Till Lowlands	2	0	2	0	23	11	0	28	1	20	11	3	0	0	0	0	100
Eastern Passage Complex	0	27	4	0	34	13	0	6	5	5	0	6	0	0	0	0	100
Elevenmile Till Lowlands	0	0	0	1	22	9	0	30	0	18	10	0	0	9	1	0	100
Etolin Granitics	0	30	3	0	24	12	0	5	3	7	0	9	0	4	0	1	100
Foggy Bay Till Lowlands	0	0	5	0	24	13	0	36	0	21	0	0	0	1	0	0	100
Freshwater Bay Carbonates	8	13	6	0	26	24	0	1	7	1	3	10	0	1	2	0	100
Gulf of Esquibel Till Lowlands	0	0	1	0	25	6	0	24	0	42	1	0	0	0	0	0	100
Hetta Inlet Metasediments	0	8	6	1	18	24	0	3	2	8	0	7	0	20	1	0	100
Holkham Bay Complex	0	24	4	0	21	35	0	2	1	5	0	4	0	2	1	0	100
Hood-Gambier Bay Carbonates	0	6	1	0	30	37	0	9	8	4	0	4	0	0	1	0	100
Kake Volcanics	1	1	23	0	19	10	0	15	0	14	2	14	0	0	0	0	100
Kasaan Peninsula Volcanics	0	0	60	2	13	5	0	3	0	12	0	1	0	1	0	3	100
Ketchikan Mafics/Ultramafics	0	14	27	0	22	9	0	7	2	5	0	11	0	1	0	1	100
Klawock Inlet Till Lowlands	0	0	30	0	2	2	0	1	0	1	0	1	0	62	1	0	100
Kook Lake Carbonates	5	7	5	0	15	39	0	5	5	0	1	15	0	0	3	0	100
Kuiu-POW Granitics	2	12	2	0	33	23	0	3	6	5	0	9	0	2	0	0	100
Misty Fjords Granitics	0	43	6	0	21	5	0	3	5	6	0	7	0	3	0	0	100
Mitchell-Hasselborg Till Lowlands	0	0	6	0	38	33	0	16	0	7	0	0	0	0	0	0	100
Moira Sound Complex	0	6	4	4	29	16	0	11	2	17	0	4	0	7	0	0	100
Mount Edgecumbe Volcanics	7	2	1	0	4	31	0	11	2	19	18	4	0	0	1	0	100
Necker Bay Granitics	0	24	11	0	12	10	0	2	12	9	0	8	0	11	0	0	100
North Admiralty Complex	0	32	2	0	27	20	0	2	11	2	0	2	0	0	0	0	100
North Baranof Complex	5	12	3	0	7	41	0	1	8	5	1	15	0	0	2	0	100
North Chichagot Granitics	8	26	6	0	5	17	0	2	7	4	6	11	0	5	3	0	100
North POW-Kuiu Carbonates	0	1	5	0	30	30	0	5	0	5	1	22	0	0	0	0	100
North POW Complex	0	1	2	1	37	17	0	14	0	14	2	11	0	0	0	0	100
Outer Coast Wave-cut Terraces	1	0	9	0	15	15	0	21	0	29	7	0	0	2	1	0	100
Outer Islands Complex	0	5	1	0	52	15	0	5	1	6	0	7	0	7	0	0	100
Peril Strait Granitics	10	14	2	0	14	28	0	4	7	3	2	9	0	2	4	0	100
Point Adolphus Carbonates	6	9	8	0	13	39	0	3	6	1	6	5	0	0	5	0	100
Princess Bay Volcanics	0	0	5	1	42	11	0	31	0	6	1	3	0	0	0	0	100
Puget Peninsula Metasediments	2	35	35	0	4	1	2	0	6	0	0	1	4	7	3	0	100
Rowan Sediments	1	0	2	0	37	38	0	4	1	5	0	11	0	0	1	0	100
Sitka Sound Complex	1	6	5	0	11	35	0	11	4	13	3	7	0	2	1	0	100
Skowl Arm Till Lowlands	0	2	25	3	17	6	0	11	0	29	0	4	0	3	1	0	100
Soda Bay Till Lowlands	0	1	25	3	18	9	0	11	0	23	1	4	0	3	0	0	100
South Admiralty Volcanics	0	14	2	0	34	21	0	6	5	4	0	13	0	0	1	0	100
South Baranof Sediments	0	26	20	0	8	13	0	1	9	6	1	10	0	5	0	0	100
South POW Granitics	0	1	6	4	19	10	0	21	0	28	0	1	0	8	2	0	100
St. Elias-Fairweather Icefields	1	61	9	0	1	0	7	0	0	0	0	14	1	6	0	0	100
Stephens Passage Glaciomarine Terraces	1	2	5	0	35	23	0	13	1	15	2	0	1	0	2	0	100
Stephens Passage Volcanics	0	15	1	0	41	21	0	6	6	4	0	4	0	0	1	0	100
Stikine River Delta	0	1	28	0	8	37	0	3	3	5	0	4	2	0	8	0	100
Stikine Strait Complex	0	7	1	0	32	16	0	16	0	15	0	12	0	0	0	0	100
Stikine-Taku River Valleys	0	2	30	0	15	15	1	0	10	4	1	4	8	2	8	0	100
Sumner Strait Volcanics	18	1	1	0	28	18	0	14	0	12	3	4	0	0	0	0	100
Thayer Lake Granitics	0	13	5	0	41	24	0	7	4	6	0	1	0	0	0	0	100
Thomas Bay Outwash Plains	0	0	18	0	18	25	0	11	0	19	2	3	0	3	0	0	100
Thorne Arm Granitics	0	1	2	3	35	9	0	18	0	21	1	10	0	0	0	0	100
Traitors Cove Metasediments	0	7	13	0	38	12	0	11	0	9	1	7	0	0	0	0	100
Ushk-Patterson Bay Granitics	10	6	3	0	7	31	0	6	5	7	7	11	0	6	2	0	100
Vixen Inlet Till Lowlands	0	0	2	0	34	5	0	32	0	21	7	0	0	0	0	0	100
Wachusett-Adams Hills	0	0	14	0	0	3	0	0	1	77	2	2	0	0	2	0	100
West Chichagof Complex	0	10	7	0	4	17	0	9	5	15	3	9	0	18	2	0	100
Wrangell Narrows Metasediments	0	7	9	0	35	13	0	11	2	10	2	10	0	0	0	0	100
Yakutat-Lituya Forelands	5	0	12	0	4	5	1	9	0	1	20	6	8	1	27	0	100
Zimovia Strait Complex	2	3	8	0	32	15	0	17	2	14	0	6	0	0	0	0	100

Codes: A = Alder, Alp = Alpine, B = Brush, C = Cedar, H = Hemlock, HS = Hemlock-Spruce, I = Ice, LP = Lodgepole Pine, L = Landslides, MC = Mixed Conifer, M = Marsh, O = Other, P = Poplar, R = Rock, S = Spruce, W = Freshwater, and GRID = Percent of the GRID reporting data.

The forest productivity (FPROD), forest type (FTYPE), and non-forest condition class (NFCON) data items in the Tongass land and timber type inventory (TIMTYP) data layer were queried in GIS to generate landcover class percentages.

Appendix L. Productive forest land percentages for 73 ecological subsections of Southeast Alaska.

Subsection Name	Productive Forests	Nonproductive Forests	Nonforested	Percent GRID reporting data
Affleck Canal Till Lowlands	49	49	2	100
Alvin Bay Sediments	72	26	2	100
Behm Canal Complex	40	41	19	100
Bell Island Granitics	43	39	18	100
Berg Bay Complex	77	13	10	100
Boca De Quadra Complex	45	53	2	100
Boundary Ranges Icefields	7	9	84	96
Cape Fanshaw Complex	67	27	5	100
Central Baranof Metasediments	15	20	64	100
Central POW Till Lowlands	60	29	11	100
Central POW Volcanics	54	30	16	99
Chilkat Complex	22	31	47	100
Chilkat Peninsula Carbonates	28	18	54	100
Clarence Strait Volcanics	34	24	41	100
Dall-Outside Complex	47	21	33	100
Duke Island Till Lowlands	13	54	34	100
Duncan Canal Till Lowlands	36	52	13	100
Eastern Passage Complex	47	29	23	100
Elevenmile Till Lowlands	32	48	19	100
Etolin Granitics	38	44	19	100
Foggy Bay Till Lowlands	37	59	5	100
Freshwater Bay Carbonates	58	17	25	100
Gulf of Esquibel Till Lowlands	32	66	2	100
Hetta Inlet Metasediments	47	21	31	100
Holkham Bay Complex	57	21	22	100
Hood-Gambier Bay Carbonates	68	23	9	100
Kake Volcanics	37	34	28	89
Kasaan Peninsula Volcanics	20	17	63	100
Ketchikan Matics Ultramatics	34	30	36	100
Klawock Inlet Till Lowlands	13	2	86	100
Kook Lake Carbonates	66	19	15	100
Kuiu-POW Granitics	59	25	15	100
Misty Fjords Granitics	27	34	38	100
Mitchell-Hasselborg Till Lowlands	71	23	7	100
Moira Sound Complex	49	39	13	100
Mount Edgecumbe Volcanics	38	39	22	100
Necker Bay Granitics	22	35	42	100
North Admiralty Complex	48	22	31	100
North Baranof Complex	52	30	18	100
North Chichagof Granitics	25	27	47	100
North POW-Kuiu Carbonates	81	11	8	100
North POW Complex	63	32	5	100
Outer Coast Wave-cut Terraces	32	51	17	100
Outer Islands Complex	68	25	7	100
Peril Strait Granitics	49	29	23	100
Point Adolphus Carbonates	57	20	23	100
Princess Bay Volcanics	57	37	6	100
Puget Peninsula Metasediments	12	4	83	100
Rowan Sediments	86	11	2	100
Sitka Sound Complex	49	36	15	100
Skowl Arm Till Lowlands	31	46	23	100
Soda Bay Till Lowlands	31	38	31	100
South Admiralty Volcanics	56	29	15	100
South Baranof Sediments	21	26	53	100
South POW Granitics	35	56	8	100
St. Elias-Fairweather Icefields	4	3	93	55
Stephens Passage Glaciomarine Terraces	61	32	8	100
Stephens Passage Volcanics	62	26	12	100
Stikine River Delta	57	13	30	100
Stikine Strait Complex	52	44	5	100
Stikine-Taku River Valleys	46	15	39	100
Sumner Strait Volcanics	48	48	4	100
Thayer Lake Granitics	65	25	10	100
Thomas Bay Outwash Plains	45	34	21	100
Thorne Arm Granitics	48	48	4	100
Traitors Cove Metasediments	55	31	14	100
Ushk-Patterson Bay Granitics	40	40	20	100
Vixen Inlet Till Lowlands	39	52	9	100
Wachusett-Adams Hills	5	80	16	100
West Chichagof Complex	22	40	37	100
Wrangell Narrows Metasediments	54	32	14	100
Yakutat-Lituya Forelands	49	17	34	100
Zimovia Strait Complex	51	40	9	100

The forest cover type (CT) and stand size class (SSIZEC) data items in the Tongass land and timber type inventory (TIMTYP) data layer were queried in GIS to generate productive forest land percentages.

Appendix M. Forest site index percentages for 69 ecological subsections of Southeast Alaska.

Subsection Name	0-40 Site Index	41-60 Site Index	61-80 Site Index	>80 Site Index	Percent GRID reporting data
Affleck Canal Till Lowlands	55	21	19	6	100
Alvin Bay Sediments	30	20	36	14	100
Behm Canal Complex	78	5	8	9	89
Bell Island Granitics	48	30	11	11	99
Berg Bay Complex	1	39	52	7	100
Boca De Quadra Complex	95	0	0	5	100
Boundary Ranges Icefields	84	11	3	1	87
Cape Fanshaw Complex	30	38	19	13	100
Central Baranof Metasediments	69	16	10	5	97
Central POW Till Lowlands	13	49	15	23	82
Central POW Volcanics	32	19	17	32	76
Chilkat Complex	34	40	19	7	100
Chilkat Peninsula Carbonates	61	21	11	7	100
Clarence Strait Volcanics	13	22	12	53	97
Dall-Outside Complex	9	22	23	46	98
Duke Island Till Lowlands	36	29	0	35	100
Duncan Canal Till Lowlands	58	20	14	8	100
Eastern Passage Complex	38	35	17	10	100
Elevenmile Till Lowlands	37	26	22	15	84
Etolin Granitics	37	43	17	3	100
Foggy Bay Till Lowlands	85	0	0	15	100
Freshwater Bay Carbonates	37	26	16	21	100
Gulf of Esquibel Till Lowlands	7	41	28	24	99
Hetta Inlet Metasediments	13	19	21	47	93
Hotkham Bay Complex	49	20	12	18	98
Kake Volcanics	36	15	27	22	100
Kasaan Peninsula Volcanics	24	20	36	20	75
Ketchikan Mafics/Ultramafics	26	22	9	43	97
Klawock Inlet Till Lowlands	8	9	20	63	72
Kook Lake Carbonates	24	23	23	29	100
Kuiu-POW Granitics	25	44	17	14	82
Misty Fjords Granitics	98	2	0	0	91
Moira Sound Complex	42	28	16	14	97
Mount Edgecumbe Volcanics	45	26	22	6	100
Necker Bay Granitics	83	12	3	2	65
North Admiralty Complex	31	25	16	28	14
North Baranof Complex	34	20	26	20	100
North Chichagof Granitics	64	17	13	6	100
North POW-Kuiu Carbonates	11	19	8	63	76
North POW Complex	18	55	7	20	74
Outer Coast Wave-cut Terraces	68	26	5	1	57
Outer Islands Complex	100	0	0	0	100
Peril Strait Granitics	38	26	22	14	100
Point Adolphus Carbonates	53	19	12	16	100
Princess Bay Volcanics	62	10	9	20	100
Puget Peninsula Metasediments	100	0	0	0	<1
Rowan Sediments	16	12	19	53	100
Sitka Sound Complex	33	16	34	17	100
Skowl Arm Till Lowlands	14	29	26	31	99
Soda Bay Till Lowlands	10	25	22	43	99
South Baranof Sediments	43	43	13	2	71
South POW Granitics	51	27	17	5	99
St. Elias-Fairweather Icefields	77	16	4	2	15
Stephens Passage Glaciomarine Terraces	35	30	21	14	68
Stephens Passage Volcanics	44	31	19	6	42
Stikine River Delta	38	8	28	26	100
Stikine Strait Complex	36	33	25	6	100
Stikine-Taku River Valleys	52	20	21	7	100
Sumner Strait Volcanics	52	20	18	10	100
Thomas Bay Outwash Plains	37	18	15	30	100
Thorne Arm Granitics	45	14	25	16	97
Traitors Cove Metasediments	18	28	17	38	97
Ushk-Patterson Bay Granitics	50	20	18	11	100
Vixen Inlet Till Lowlands	30	39	10	20	100
Wachusett-Adams Hills	100	0	0	0	100
West Chichagof Complex	96	1	2	1	80
Wrangell Narrows Metasediments	36	21	25	18	100
Yakutat-Lituya Forelands	59	2	12	27	89
Zimovia Strait Complex	38	28	27	8	95

The site index category (SI-CAT) data item in the common land unit (CLU) data layer was queried in GIS.

Appendix N. Forest harvest acres by decade, total harvest acres, productive forest acres, and percent productive forests harvested for 70 ecological subsections of Southeast Alaska.

Subsection Name	Prior to 1950	1950s	1960s	1970s	1980s	1990s	Total Harvest Acres	Productive Forest Acres	Percent Harvested
Affleck Canal Till Lowlands	40	0	0	0	0	0	40	27,700	0.14
Alvin Bay Sediments	300	40	620	0	120	0	1,080	58,780	1.84
Behm Canal Complex	0	60	1,260	1,240	1,060	300	3,920	93,860	4.18
Bell Island Granitics	100	1,340	240	120	500	1,260	3,560	143,020	2.49
Boca De Quadra Complex	0	0	0	0	0	0	0	57,240	0
Boundary Ranges Icefields	0	100	2,620	1100	640	0	4,460	267,280	1.67
Cape Fanshaw Complex	160	0	120	0	80	0	360	45,760	0.79
Central Baranof Metasediments	100	120	5,200	400	0	0	5,820	54,540	10.67
Central POW Till Lowlands	540	1,060	6,600	11,640	10,040	4,000	33,880	146,340	23.15
Central POW Volcanics	200	2,040	30,960	11,740	16,180	9,820	70,940	268,580	26.41
Chilkat Peninsula Carbonates	3,740	0	0	340	440	620	5,140	93,880	5.48
Clarence Strait Volcanics	420	840	0	0	0	0	1,260	89,000	1.42
Dall-Outside Complex	220	100	300	0	440	240	1,300	134,600	0.97
Duke Island Till Lowlands	0	240	0	0	0	0	240	8,120	2.96
Duncan Canal Till Lowlands	580	260	440	2,220	2,120	1,160	6,780	87,560	7.74
Eastern Passage Complex	0	280	180	920	460	0	1,840	115,800	1.59
Elevenmile Till Lowlands	0	0	20	0	20	0	40	15,520	0.26
Etolin Granitics	140	200	60	40	360	1,020	1,820	33,460	5.44
Foggy Bay Till Lowlands	0	0	0	0	0	0	0	20,640	0
Freshwater Bay Carbonates	5,920	60	1,280	2,120	7,060	5,580	22,020	151,300	14.55
Gulf of Esquibel Till Lowlands	0	20	0	0	0	0	20	14,760	0.14
Hetta Inlet Metasediments	220	620	7,340	1,920	3,520	1,260	14,880	108,440	13.72
Holkham Bay Complex	220	0	0	0	40	0	260	289,540	0.09
Hood-Gambier Bay Carbonates	0	0	0	0	0	0	0	149,380	0
Kake Volcanics	40	20	1,740	3,320	1,040	720	6,880	44,620	15.42
Kasaan Peninsula Volcanics	0	0	60	0	0	0	60	7,100	0.85
Ketchikan Mafics Ultramafics	0	0	0	0	460	940	1,400	23,100	6.06
Klawock Inlet Till Lowlands	0	0	0	100	1,140	0	1,240	2,000	62
Kook Lake Carbonates	320	0	360	7,560	380	3,200	11,820	68,020	17.38
Kuiu-POW Granitics	1,440	40	180	1,400	880	1,080	5,020	87,280	5.75
Misty Fjords Granitics	0	0	820	120	440	0	1,380	399,620	0.35
Mitchell-Hasselborg Till Lowlands	0	0	0	0	0	0	0	65,700	0
Moira Sound Complex	80	0	0	20	0	0	100	59,240	0.17
Mount Edgecumbe Volcanics	40	0	2,260	1,480	0	0	3,780	27,980	13.51
Necker Bay Granitics	140	0	0	0	0	0	140	41,560	0.34
North Admiralty Complex	0	0	0	0	0	0	0	148,760	0
North Baranof Complex	180	280	7,880	1,620	0	200	10,160	66,600	15.26
North Chichagof Granitics	40	40	180	100	1,940	740	3,040	102,220	2.97
North POW-Kuiu Carbonates	2,180	6,460	20,220	30,240	21,260	4,240	84,600	207,160	40.84
North POW Complex	0	0	660	1,440	3,620	1,500	7,220	51,100	14.13
Outer Coast Wave-cut Terraces	0	0	0	0	0	0	0	39,100	0
Outer Islands Complex	0	0	0	0	0	0	0	20,680	0
Peril Strait Granitics	580	500	2,720	6,380	320	640	11,140	113,720	9.8
Point Adolphus Carbonates	1,100	0	360	140	780	100	2,480	66,820	3.71
Princess Bay Volcanics	0	240	520	2,200	1,160	0	4,120	31,820	12.95
Puget Peninsula Metasediments	0	0	0	0	0	0	0	12,260	0
Rowan Sediments	280	220	1,140	7,540	4,500	1,760	15,440	113,400	13.62
Sitka Sound Complex	260	1,100	4,260	2,800	0	0	8,420	92,020	9.15
Skowl Arm Till Lowlands	200	220	300	640	2,520	0	3,880	27,180	14.28
Soda Bay Till Lowlands	0	200	240	1,320	0	220	1,980	47,440	4.17
South Admiralty Volcanics	0	0	0	0	0	0	0	104,840	0
South Baranof Sediments	0	0	0	0	0	0	0	35,960	0
South POW Granitics	40	0	0	0	0	0	40	49,520	0.08
Stephens Passage Glaciomarine Terraces	60	0	0	0	0	0	60	172,400	0.03
Stephens Passage Volcanics	20	0	0	0	0	0	20	59,680	0.03
Stikine River Delta	1,220	1,160	720	660	140	360	4,260	26,840	15.87
Stikine Strait Complex	200	20	0	100	1,820	640	2,780	33,280	8.35
Stikine-Taku River Valleys	0	0	0	0	0	0	0	40,360	0
Sumner Strait Volcanics	600	520	2,680	3,900	680	2,800	11,180	173,400	6.45
Thayer Lake Granitics	0	0	0	0	0	0	0	46,760	0
Thomas Bay Outwash Plains	0	660	3,100	320	100	160	4,340	14,020	30.96
Thorne Arm Granitics	0	0	440	600	420	1,240	2,700	30,480	8.86
Traitors Cove Metasediments	100	6,360	4,720	2,600	4,980	5,420	24,180	177,400	13.63
Ushk-Patterson Bay Granitics	220	640	1,300	0	0	0	2,160	45,780	4.72
Vixen Inlet Till Lowlands	0	0	0	0	0	0	0	10,620	0
Wachusett-Adams Hills	0	0	0	0	0	0	0	220	0
West Chichagof Complex	0	0	0	0	0	0	0	29,900	0
Wrangell Narrows Metasediments	900	240	2,840	9,000	7,320	2,780	23,080	170,460	13.54
Yakutat-Lituya Forelands	4,040	0	0	0	0	0	4,040	186,160	2.17
Zimovia Strait Complex	500	420	1,920	1,700	3,420	2,480	10,440	112,720	9.26

Appendix O. National Wetland Inventory percentages for 72 ecological subsections of Southeast Alaska.

Subsection Name	E1	E2	L1	L2	PAB	PEM	PFO	PML	PSS	PUB	PUS	R	U	GRID
Affleck Canal Till Lowlands	0.36	0.75	0	0.07	0.25	17.53	46.75	0	4.19	0.14	0	0	29.97	100
Alvin Bay Sediments	0.46	1.03	0.51	0.07	0.15	5.54	32.22	0	1.44	0.24	0	0	58.33	100
Behm Canal Complex	0.05	0.03	3.85	0	0.03	9.52	14.54	0	4.49	0.4	0	0.01	67.09	100
Bell Island Granitics	0.12	0.02	2.92	0	0.1	13.78	14.85	0	1.28	0.79	0	0.01	66.14	100
Boca De Ouadra Complex	0.06	0.16	0.42	0.03	0.05	7.89	31.92	0	9.06	0.22	0.02	0	50.18	100
Boundary Ranges Icefields	0.02	0.03	0.75	0	0	0.63	0.43	0	0.7	0.09	0	0.72	96.61	99
Cape Fanshaw Complex	0.15	0.56	0	0	0.03	5.8	40.63	0.03	2.78	0	0	0	50.03	100
Central Baranof Metasediments	0.07	0.11	2.41	0.01	0.02	1.89	2.77	0.01	1.64	0.25	0	0.3	90.52	100
Central POW Till Lowlands	0.97	0.52	2.02	0.3	0.12	7.24	46.28	0.02	1	0.51	0	0.14	40.87	100
Central POW Volcanics	0.04	0.1	1.41	0.1	0.07	13.11	19.54	0.02	3.59	0.16	0	0.01	61.86	100
Chilkat Complex	0	0	1.86	0	0	0	0	0	0.19	0.37	0	0.19	97.39	100
Chilkat Peninsula Carbonates	0.03	0.24	0.18	0	0.02	1.62	6.14	0	3.99	0.11	0.01	0.46	87.2	100
Clarence Strait Volcanics	0.3	0.74	2.22	0.02	0.05	4.39	34.92	0.11	6.82	0.27	0	0.01	50.16	100
Dall-Outside Complex	0.66	0.45	0.79	0.03	0.08	2.86	12.23	0	6.35	0.22	0	0	76.32	99
Duke Island Till Lowlands	0.22	1.34	0.84	0.03	0.38	18.51	25.54	0	26.2	1.5	0.03	0	25.41	100
Duncan Canal Till Lowlands	0.09	0.66	0.4	0.08	0.07	24.67	42.1	0.31	2.41	0.13	0	0.16	28.92	100
Eastern Passage Complex	0.11	0.07	0.48	0	0.01	7.52	9.3	0	0.66	0.25	0	0.17	81.43	100
Elevenmile Till Lowlands	0.17	0.42	0	0	0.08	15.28	47.18	0	9.44	0.33	0	0.04	27.06	100
Etolin Granitics	0.05	0.07	2.34	0.05	0	7.18	7.94	0	1.58	0.34	0	0	80.47	100
Foggy Bay Till Lowlands	0.21	0.64	1.86	0	0.11	7.57	49.73	0	18.35	1.89	0	0	19.64	100
Freshwater Bay Carbonates	0.02	0.34	0.02	0.03	0.01	3.27	15.66	0	6.92	0.02	0	0.03	73.67	100
Gulf of Esquibel Till Lowlands	0.22	0.99	0.04	0	0.09	13.43	51.86	0	1.17	0.04	0	0	32.17	99
Hetta Inlet Metasediments	0.79	0.46	1.52	0.03	0.05	3.16	14.46	0	4.96	0.39	0	0.02	74.15	100
Holkham Bay Complex	0.12	0.27	0.59	0.02	0.02	4.12	12.49	0.13	2.38	0.11	0	0.15	79.61	100
Hood-Gambier Bay Carbonates	0.05	0.33	0.42	0.1	0.05	5.6	16.76	0.08	2.59	0.03	0	0	73.99	100
Kake Volcanics	0.12	1.18	0.1	0	0.09	8.02	44.34	0.07	3.46	0.07	0	0.09	42.45	100
Kasaan Peninsula Volcanics	0.22	0.39	0	0	0	4.42	26.48	0	4.76	0.34	0	0	63.38	100
Ketchikan Mafics/Ultramafics	0.03	0.03	2.73	0.12	0.03	1.77	20.63	0.03	5.84	0.17	0	0.03	68.59	100
Klawock Inlet Till Lowlands	1.66	1.66	0.64	0	0	3.59	22.66	0	2.56	0.38	0	0	66.84	100
Kook Lake Carbonates	0	0.2	0.86	0	0	5.1	12.87	0.02	0.66	0.08	0	0	80.21	100
Kuiu-POW Granitics	0.04	0.33	0.75	0.04	0.04	6.42	9.72	0	1.22	0.08	0	0	81.37	100
Misty Fjords Granitics	0.15	0.1	1.39	0.01	0.02	4.96	7.75	0.01	2.03	0.26	0	0.38	82.94	100
Mitchell-Hasselborg Till Lowlands	0.19	0.5	4.8	0.34	0.28	4.89	36.51	0.28	3.88	0.67	0	0	47.66	100
Moira Sound Complex	0.54	0.39	3.52	0.02	0.03	0.56	18.3	0	12.51	0.8	0	0.02	63.32	100
Mount Edgecumbe Volcanics	0.03	0.44	0.03	0.03	0.08	10.69	36.51	0.16	16.68	0.05	0	0	35.3	100
Necker Bay Granitics	1.75	0.12	2.61	0.01	0	4.41	5.28	0	1.94	0.19	0	0.03	83.66	100
North Admiralty Complex	0.03	0.05	1.2	0.03	0.01	2.78	4.72	0	1.39	0.15	0	0	89.65	100
North Baranof Complex	0.03	0.54	0.33	0.05	0.02	6.56	14.25	0.02	2.32	0.16	0	0.05	75.69	100
North Chichagof Granitics	0.01	0.25	0.18	0	0.01	6.9	9.29	0	8.34	0.18	0.01	0.15	74.66	36
North POW-Kuiu Carbonates	0.25	0.67	0.82	0.18	0.05	3.24	13.77	0.07	0.57	0.14	0	0	80.23	100
North POW Complex	0.25	0.79	1.08	0.15	0.07	12.07	33.96	0.05	0.69	0.34	0	0	50.55	100
Outer Coast Wave-cut Terraces	1.51	2.4	2.89	0.18	0.83	19.63	24.88	0	5.65	0.71	0	0	41.32	53
Outer Islands Complex	0	0	0	0	0.36	11.45	6.62	0	1.07	0.18	0	0	80.32	37
Peril Strait Granitics	0.09	0.24	0.31	0.05	0	6.79	17.88	0.01	3.88	0.11	0	0	70.65	100
Point Adolphus Carbonates	0.05	0.44	0.31	0	0.02	1.5	15.85	0	11.44	0.12	0	0.07	70.21	100
Princess Bay Volcanics	0.21	0.18	4.14	0.04	0	5.86	60.16	0	2.47	1.32	0	0	25.62	100
Puget Peninsula Metasediments	0.5	0.2	0.2	0	0	0.06	0.5	0	1.12	0.06	0	0.3	97.06	100
Rowan Sediments	0.26	0.96	0.12	0.05	0	3.95	20.17	0.02	1.58	0.02	0	0.02	72.86	100
Sitka Sound Complex	0.35	0.67	0.43	0.07	0.03	5.76	20.16	0	5.43	0.07	0	0	67.02	100
Skowl Arm Till Lowlands	0.45	0.43	2.75	0.11	0.05	2.48	39.42	0	6.47	1.62	0	0	46.21	100
Soda Bay Till Lowlands	0.62	0.78	0.38	0.01	0.09	6.21	40.11	0	4.38	0.42	0	0.01	46.96	100
South Admiralty Volcanics	0.05	0.27	0.27	0	0.06	8.93	17.18	0.17	1.95	16.2	0	0.01	54.91	100
South Baranof Sediments	0.08	0.23	5.09	0.01	0.04	5.88	3.99	0	1.37	0.46	0	0.01	82.84	100
South POW Granitics	0.66	1.03	1.81	0.07	0.13	0.61	23.09	0	20.72	0.88	0.01	0.04	50.95	100
St. Elias-Fairweather Icefields	0.02	0.03	2.51	0.02	0	0.36	0.03	0	0.3	0.06	0.01	0.49	96.16	78
Stephens Passage Glaciomarine Terraces	0.08	1.08	0.45	0.01	0.05	6.91	19.2	0.01	6.29	0.23	0	0.74	64.94	100
Stephens Passage Volcanics	0.04	0.44	0.04	0	0.02	4.24	12.86	0.17	1.58	0.12	0	0	80.49	100
Stikine River Delta	0.13	3.7	0	0	0	10.72	1.62	0.34	1.87	0.04	0	10.42	71.16	100
Stikine Strait Complex	0.09	0.19	0.37	0	0.03	11.85	28.12	0	1.21	0.34	0	0	57.79	100
Stikine-Taku River Valleys	0.38	0.4	1.28	0.05	0	9.88	0.85	0	6.44	0.28	0	12.57	67.87	90
Sumner Strait Volcanics	0.08	0.54	0.17	0.07	0.11	19.85	37.4	0.01	5.66	0.5	0	0.01	35.6	100
Thayer Lake Granitics	0.03	0.08	3.97	0.06	0.08	7.37	16.09	0.08	6.03	0.08	0	0	66.12	100
Thomas Bay Outwash Plains	0.65	1.42	1.68	0.13	0	12.26	26.97	0	1.42	1.61	0	1.74	52.13	100
Thorne Arm Granitics	0.16	0.44	1.32	0.03	0	5.63	45.26	0	6.04	0.66	0	0	40.45	100
Traitors Cove Metasediments	0.11	0.19	1.62	0.02	0.04	10.19	24.53	0	2.79	0.41	0	0.03	60.06	100
Ushk-Patterson Bay Granitics	0.05	0.69	0.59	0.05	0.09	12.9	16.51	0.03	7.99	0.07	0	0	61.02	100
Vixen Inlet Till Lowlands	0	0.58	0.65	0.07	0.29	21.75	55.71	0	2.69	0.07	0	0	18.18	100
Wachusett-Adams Hills	0	0	0.41	0	0	0.82	0.41	0	1.65	0	0	3.29	93.42	100
West Chichagof Complex	0.3	0.23	1.13	0.07	0.07	11.71	13.13	0.05	2.71	0.46	0	0	70.15	65
Wrangell Narrows Metasediments	0.07	0.34	0.24	0.01	0.01	13.91	18.33	0	0.41	0.08	0	0.15	66.45	100
Yakutat-Lituya Forelands	0.39	1.98	1.11	0.13	0.26	25.49	7.21	0	12.83	0.54	0.01	1.49	48.58	100
Zimovia Strait Complex	0.4	0.15	0.46	0.03	0.04	13.91	32.17	0	2.28	0.26	0	0	50.3	100

Codes: E1 = Estuarine Subtidal, E2 = Estuarine Intertidal, L1 = Lacustrine Limnetic, L2 = Lacustrine Littoral, PAB = Palustrine Aquatic Bed, PEM = Palustrine Emergent, PFO = Palustrine Forested, PML = Palustrine Moss-Lichen, PSS Palustrine Scrub-Shrub, PUB = Palustrine Unconsolidated Bottom, PUS = Palustrine Unconsolidated Shore, R = Riverine, U = Upland, and GRID = Percent of the GRID reporting data.

Wetland categories are defined in the glossary.

The National Wetland Inventory data layer was queried to generate wetland percentages.

Appendix P. Stream process group percentages for 72 ecological subsections of Southeast Alaska.

Subsection Name	AF	ES	FP	GO	HC	L	LC	MC	MM	PA
Affleck Canal Till Lowlands	1	1	5	0	62	2	0	11	14	3
Alvin Bay Sediments	2	1	7	0	60	3	1	7	16	4
Behm Canal Complex	3	1	10	0	60	10	2	3	6	5
Bell Island Granitics	2	0	4	0	64	14	2	6	6	2
Berg Bay Complex	0	2	0	0	81	2	0	2	12	0
Boca De Ouadra Complex	0	0	4	0	53	4	5	13	15	6
Boundary Ranges Icefields	5	0	4	13	67	4	0	1	2	3
Cape Fanshaw Complex	1	1	6	0	65	0	7	7	12	1
Central Baranof Metasediments	7	0	8	4	62	8	1	2	8	0
Central POW Till Lowlands	1	2	11	0	32	10	3	14	13	13
Central POW Volcanics	2	0	6	0	74	3	1	5	7	2
Chilkat Complex	6	0	0	18	56	5	8	4	3	0
Chilkat Peninsula Carbonates	5	1	7	5	61	1	2	8	7	2
Clarence Strait Volcanics	4	1	10	0	47	6	1	15	13	3
Dall-Outside Complex	1	1	5	0	71	4	0	7	8	2
Duke Island Till Lowlands	0	4	6	0	1	21	0	36	8	24
Duncan Canal Till Lowlands	1	3	18	0	21	3	6	16	19	12
Eastern Passage Complex	2	1	7	3	67	2	2	6	8	1
Elevenmile Till Lowlands	2	0	5	0	64	1	3	10	14	2
Etolin Granitics	4	1	3	0	74	8	1	3	6	1
Foggy Bay Till Lowlands	0	2	10	0	13	11	8	20	34	1
Freshwater Bay Carbonates	6	1	10	0	62	0	3	8	7	2
Gulf of Esquibel Till Lowlands	1	2	3	0	44	3	0	35	12	0
Hetta Inlet Metasediments	2	1	5	0	75	5	0	4	6	2
Holkham Bay Complex	4	2	6	2	69	2	2	5	7	2
Hood-Gambier Bay Carbonates	1	3	10	0	68	2	1	6	8	2
Kake Volcanics	0	4	18	0	24	1	5	8	29	10
Kasaan Peninsula Volcanics	2	1	3	0	73	2	0	12	7	1
Ketchikan Mafics/Ultramafics	4	1	6	0	65	10	1	5	8	0
Klawock Inlet Till Lowlands	0	4	34	0	39	5	2	4	12	0
Kook Lake Carbonates	10	2	15	0	54	2	4	5	7	1
Kuiu-POW Granitics	3	1	3	0	81	3	1	3	6	1
Misty Fjords Granitics	2	1	8	2	68	5	1	1	8	3
Mitchell-Hasselborg Till Lowlands	0	4	23	0	16	17	7	14	9	10
Moira Sound Complex	2	1	3	0	61	14	1	11	4	3
Mount Edgecumbe Volcanics	1	2	14	0	49	0	3	30	1	0
Necker Bay Granitics	7	1	4	0	65	11	1	4	6	1
North Admiralty Complex	1	0	7	0	77	3	1	3	6	1
North Baranof Complex	8	3	15	0	55	2	3	4	9	1
North Chichagof Granitics	6	3	7	2	61	4	2	6	7	1
North POW-Kuiu Carbonates	1	1	6	0	63	4	1	7	10	5
North POW Complex	1	0	4	0	77	3	0	9	5	1
Outer Coast Wave-cut Terraces	1	4	3	0	26	23	3	31	3	6
Peril Strait Granitics	8	3	11	0	59	1	3	7	7	1
Point Adolphus Carbonates	5	6	14	0	51	1	3	10	5	3
Princess Bay Volcanics	0	0	9	0	37	12	2	13	12	14
Puget Peninsula Metasediments	4	0	1	7	79	1	0	3	6	1
Rowan Sediments	1	2	8	0	61	0	2	3	18	5
Sitka Sound Complex	5	2	9	0	65	2	2	9	5	1
Skowl Arm Till Lowlands	3	0	2	0	60	16	1	8	5	3
Soda Bay Till Lowlands	1	2	7	0	59	5	1	11	11	3
South Admiralty Volcanics	2	3	12	0	64	1	1	9	7	1
South Baranof Sediments	8	0	3	1	63	14	0	2	8	1
South POW Granitics	2	1	4	0	45	15	2	17	10	4
St. Elias-Fairweather Icefields	4	1	1	10	73	5	0	3	3	0
Stephens Passage Glaciomarine Terraces	2	7	23	4	30	2	2	12	7	11
Stephens Passage Volcanics	1	1	2	0	80	0	0	9	6	0
Stikine River Delta	0	48	7	4	23	0	0	0	5	12
Stikine Strait Complex	1	1	5	0	68	3	1	6	13	1
Stikine-Taku River Valleys	4	2	10	26	26	2	0	1	2	27
Sumner Strait Volcanics	2	2	13	0	41	3	3	11	19	7
Thayer Lake Granitics	1	0	9	0	64	8	3	8	2	3
Thomas Bay Outwash Plains	1	12	11	21	23	6	0	5	13	10
Thorne Arm Granitics	1	1	8	0	54	8	3	11	11	3
Traitors Cove Metasediments	3	1	8	0	64	6	1	8	8	2
Ushk-Patterson Bay Granitics	9	2	14	0	60	1	1	6	6	1
Vixen Inlet Till Lowlands	1	4	17	0	18	5	6	28	17	5
Wachusett-Adams Hills	4	0	62	30	3	2	0	0	0	0
West Chichagof Complex	6	2	9	0	61	7	2	5	7	1
Wrangell Narrows Metasediments	2	2	9	0	55	1	2	9	17	3
Yakutat-Lituya Forelands	0	3	54	8	1	2	0	1	0	30
Zimovia Strait Complex	1	1	6	0	66	3	2	7	13	2

Codes: AF = Alluvial fan, ES = Estuarine, FP = Flood plain, GO = Glacial outwash, HC = High gradient contained, L = Lake, LC = Low gradient contained, MC = Moderate gradient contained, MM = Moderate gradient mixed control, and PA = Palustrine.

The channel type code (CHANTYP) data item in the Tongass streams (STREAMS) data layer was queried in GIS. The following codes were grouped to generate stream process group percentages: Alluvial Fan = AF1, AF2, AF8, B5 & D6; Estuary = all codes starting with "E;" Floodplain = B1, B1.4, C1, C1.4, C3, C3.3, C3.4 & all codes starting with "FP;" Glacial Outwash = D1 & all codes starting with "GO;" High-gradient & Contained = A1, A2, A3, A4, A5, A6, A7, A7.4, D2 & all codes starting with "HC;" Lake = L; Low-gradient & Contained = C2, C2.7, C5 & all codes starting with "LC;" Moderate-gradient & Contained = B4, B4.4, B6, B7 & all codes starting with "MC;" Moderate-gradient & Mixed control = B2, B2.4, B3, B3.4, B3L & all codes starting with "MM;" and Palustrine = L1, L1.4, L2, L3 and all codes starting with "PA."

Stream process groups are defined in the glossary.

Appendix Q. Land use designation percentages for 73 ecological subsections of Southeast Alaska.

Subsection Name	Wilderness & National Monument	Mostly Natural Setting	Moderate Development	Intensive Development	Private	% GRID reporting data
Atfleck Canal Till Lowlands	38	62	0	0	0	100
Alvin Bay Sediments	53	47	0	0	0	100
Behm Canal Complex	65	18	2	14	1	100
Bell Island Granitics	14	66	9	10	0	100
Berg Bay Complex	99	0	0	0	1	100
Boca De Quadra Complex	100	0	0	0	0	100
Boundary Ranges Icefields	32	62	2	3	1	100
Cape Fanshaw Complex	0	48	27	21	4	100
Central Baranof Metasediments	20	65	2	9	3	100
Central POW Till Lowlands	0	49	16	27	8	100
Central POW Volcanics	8	25	19	33	15	100
Chilkat Complex	0	95	0	0	5	100
Chilkat Peninsula Carbonates	25	51	13	7	3	100
Clarence Strait Volcanics	15	34	5	7	40	100
Dall-Outside Complex	0	63	5	3	30	100
Duke Island Till Lowlands	0	72	0	0	27	100
Duncan Canal Till Lowlands	6	40	10	43	1	100
Eastern Passage Complex	23	33	29	13	2	100
Elevenmile Till Lowlands	0	53	0	38	9	100
Etolin Granitics	37	19	26	19	0	100
Foggy Bay Till Lowlands	100	0	0	0	0	100
Freshwater Bay Carbonates	0	30	3	53	14	100
Gulf of Esquibel Till Lowlands	12	88	0	0	0	100
Hetta Inlet Metasediments	1	31	8	24	36	100
Holkham Bay Complex	32	39	7	16	6	100
Hood-Gambier Bay Carbonates	98	0	0	0	2	100
Kake Volcanics	0	23	5	33	39	100
Kasaan Peninsula Volcanics	0	21	7	0	71	100
Ketchikan Mafics/Ultramafics	0	66	3	7	24	100
Klawock Inlet Till Lowlands	0	5	0	0	95	100
Kook Lake Carbonates	0	39	6	55	0	100
Kuiu-POW Granitics	19	61	3	17	0	100
Misty Fjords Granitics	96	2	0	1	0	100
Mitchell-Hasselborg Till Lowlands	95	0	0	0	5	100
Moira Sound Complex	23	39	0	35	2	100
Mount Edgecumbe Volcanics	0	75	21	3	0	100
Necker Bay Granitics	82	18	0	0	0	100
North Admiralty Complex	84	7	2	0	7	100
North Baranof Complex	0	51	3	46	0	100
North Chichagof Granitics	19	69	0	11	1	100
North POW-Kuiu Carbonates	0	28	7	55	10	100
North POW Complex	0	61	12	26	1	100
Outer Coast Wave-cut Terraces	74	22	0	0	4	100
Outer Islands Complex	100	0	0	0	0	100
Peril Strait Granitics	0	62	8	31	0	100
Point Adolphus Carbonates	0	48	0	27	25	100
Princess Bay Volcanics	62	8	10	20	0	100
Puget Peninsula Metasediments	100	0	0	0	0	100
Rowan Sediments	27	27	0	45	1	100
Sitka Sound Complex	0	67	9	15	8	100
Skowl Arm Till Lowlands	0	29	2	45	23	100
Soda Bay Till Lowlands	0	51	5	18	25	100
South Admiralty Volcanics	100	0	0	0	0	100
South Baranof Sediments	31	69	0	0	0	100
South POW Granitics	40	48	0	12	1	100
St. Elias-Fairweather Icefields	27	72	2	0	0	100
Stephens Passage Glaciomarine Terraces	36	38	10	0	16	100
Stephens Passage Volcanics	58	27	0	0	15	100
Stikine River Delta	70	13	14	0	2	100
Stikine Strait Complex	0	42	29	29	0	100
Stikine-Taku River Valleys	39	58	0	0	3	100
Sumner Strait Volcanics	0	52	4	44	0	100
Thayer Lake Granitics	100	0	0	0	0	100
Thomas Bay Outwash Plains	0	24	63	0	12	100
Thorne Arm Granitics	19	40	11	30	1	100
Traitors Cove Metasediments	0	49	16	23	12	100
Ushk-Patterson Bay Granitics	18	82	0	0	0	100
Vixen Inlet Till Lowlands	0	100	0	0	0	100
Wachusett-Adams Hills	100	0	0	0	0	100
West Chichagot Complex	93	7	0	0	1	100
Wrangell Narrows Metasediments	11	22	33	23	11	100
Yakutat-Lituya Forelands	9	71	6	6	8	100
Zimovia Strait Complex	5	28	34	26	7	100

The Revised Tongass Land and Resource Management Plan (April 1999) land use designation data layer (LUD99) was queried. The following codes were grouped to generate land use designation percentages:
Wilderness and National Monument = NM, WM & WW; Mostly Natural Setting = L2, L2RA, L2WR, MW, OG, RA, RM, RR, SA, SM, SR & WR; Moderate Development = EF, ML & SV; Intensive Development = TM; and Private = NNF.

Appendix R. Existing National Forest System Roads (as of 1998) for 85 ecological subsections of Southeast Alaska.

Subsection Name	Land Acres	Land Square Miles	Road Miles	Road Miles/Square Mile
Affleck Canal Till Lowlands	55,270	86	0	0
Alsek-Tatshenshini River Valleys	184,606	288	0	0
Alvin Bay Sediments	80,962	127	0	0
Behm Canal Complex	234,391	366	36.6	0.1
Bell Island Granitics	330,482	516	40.3	0.08
Berg Bay Complex	95,976	150	0	0
Berg-Beardslee Moraine	50,022	78	0	0
Boca De Quadra Complex	127,841	200	0	0
Boundary Ranges Icefields	4,409,154	6,889	68.5	0.01
Cape Fanshaw Complex	67,950	106	0	0
Cape Spencer Complex	63,287	99	0	0
Central Baranof Metasediments	357,933	559	49.7	0.09
Central POW Till Lowlands	243,492	380	430.6	1.13
Central POW Volcanics	496,601	776	793.2	1.02
Chilkat Complex	631,041	986	0	0
Chilkat Peninsula Carbonates	539,302	843	61.2	0.07
Chilkat River Valley	58,207	91	0	0
Clarence Strait Volcanics	256,440	401	3.6	0.01
Dall-Outside Complex	287,214	449	36.9	0.08
Duke Island Till Lowlands	63,512	99	0	0
Duncan Canal Till Lowlands	243,873	381	122.1	0.32
Dundas Bay Granitics	51,135	80	0	0
Dundas River Flats	25,072	39	0	0
Eastern Passage Complex	243,612	381	13.4	0.04
Elevenmile Till Lowlands	47,755	75	5.5	0.07
Etolin Granitics	88,711	139	23.7	0.17
Fairweather Front Range Complex	87,593	137	0	0
Foggy Bay Till Lowlands	55,863	87	0	0
Freshwater Bay Carbonates	261,058	408	319.3	0.78
Gulf of Esquibel Till Lowlands	45,292	71	0	0
Gustavus Flats	35,110	55	0	0
Hetta Inlet Metasediments	226,874	354	177.5	0.5
Holkham Bay Complex	509,344	796	91.5	0.11
Hood-Gambler Bay Carbonates	218,644	342	2.5	0.01
Hugh Miller-Geikie Inlet Mountains	81,266	127	0	0
Kake Volcanics	132,914	208	119	0.57
Kasaan Peninsula Volcanics	35,635	56	3.4	0.06
Ketchikan Mafics Ultramafics	68,966	108	46.8	0.43
Klawock Inlet Till Lowlands	14,929	23	11.1	0.47
Kook Lake Carbonates	102,061	159	127.7	0.8
Kulu-POW Granitics	147,368	230	46.3	0.2
Misty Fjords Granitics	1,843,622	2,881	16.5	0.01
Mitchell-Hasselborg Till Lowlands	93,210	146	0	0
Moira Sound Complex	121,398	190	0	0
Mount Edgecumbe Volcanics	72,983	114	48.4	0.42
Necker Bay Granitics	185,034	289	0	0
North Admiralty Complex	313,244	489	7.8	0.02
North Baranof Complex	128,386	201	83.8	0.42
North Chichagof Granitics	401,424	627	51.2	0.08
North POW-Kulu Carbonates	251,146	392	851	2.17
North POW Complex	80,949	126	83.7	0.66
Outer Coast Wave-cut Terraces	113,990	178	5.7	0.03
Outer Islands Complex	32,765	51	0	0
Peril Strait Granitics	232,737	364	105.2	0.29
Point Adolphus Carbonates	117,319	183	47.4	0.26
Princess Bay Volcanics	55,547	87	47.8	0.55
Puget Peninsula Metasediments	99,636	156	0	0
Queen-Tidal Inlet Mountains	111,076	174	0	0
Rowan Sediments	130,269	204	185.3	0.91
Salmon River Sediments	21,350	33	0	0
Sitka Sound Complex	185,705	290	110.9	0.38
Skowl Arm Till Lowlands	87,878	137	31.7	0.23
Soda Bay Till Lowlands	148,329	232	15.8	0.07
South Admiralty Volcanics	187,220	293	0	0
South Baranof Sediments	168,743	264	0	0
South POW Granitics	138,616	217	3	0.01
St. Elias-Fairweather Icefields	11,410,189	17,828	0	0
Stephens Passage Glaciomarine Terraces	282,695	442	85.6	0.19
Stephens Passage Volcanics	94,707	148	13.2	0.09
Stikine River Delta	41,886	65	7	0.11
Stikine Strait Complex	63,932	100	47.3	0.47
Stikine-Taku River Valleys	76,920	120	0	0
Sumner Strait Volcanics	358,614	560	141	0.25
Thayer Lake Granitics	71,811	112	0	0
Thomas Bay Outwash Plains	30,722	48	47.4	0.99
Thorne Arm Granitics	63,076	99	29.7	0.3
Traitors Cove Metasediments	320,810	501	255.7	0.51
Upper West Arm Mountains	25,778	40	0	0
Ushk-Patterson Bay Granitics	114,864	179	12.1	0.07
Vixen Inlet Till Lowlands	27,451	43	0	0
Wachusett-Adams Hills	142,972	223	0	0
West Chichagof Complex	133,240	208	0	0
Wrangell Narrows Metasediments	313,235	489	393.4	0.8
Yakutat-Lituya Forelands	799,335	1249	107.2	0.09
Zimovia Strait Complex	221,416	346	158.6	0.46

The 1998 National Forest System Roads data layer was queried in GIS. Existing roads labeled "E" in the database were used to calculate road miles.

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